Nokia Customer Care

Service Manual

RM-247 (Nokia N96; L3&4)

Mobile Terminal

Part No: (Issue 1)

COMPANY CONFIDENTIAL

NOKIA
Care

Copyright © 2008 Nokia. All rights reserved.

Amendment Record Sheet

Amendment No	Date	Inserted By	Comments
Issue 1	08/2008	A. Salo	

Copyright © 2008 Nokia. All rights reserved.

Copyright

Copyright © 2008 Nokia. All rights reserved.

Reproduction, transfer, distribution or storage of part or all of the contents in this document in any form without the prior written permission of Nokia is prohibited.

Nokia, Nokia Connecting People, and Nokia X and Y are trademarks or registered trademarks of Nokia Corporation. Other product and company names mentioned herein may be trademarks or tradenames of their respective owners.

Nokia operates a policy of continuous development. Nokia reserves the right to make changes and improvements to any of the products described in this document without prior notice.

Under no circumstances shall Nokia be responsible for any loss of data or income or any special, incidental, consequential or indirect damages howsoever caused.

The contents of this document are provided "as is". Except as required by applicable law, no warranties of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to the accuracy, reliability or contents of this document. Nokia reserves the right to revise this document or withdraw it at any time without prior notice.

The availability of particular products may vary by region.

IMPORTANT

This document is intended for use by qualified service personnel only.

Copyright © 2008 Nokia. All rights reserved.

Warnings and cautions

Warnings

- IF THE DEVICE CAN BE INSTALLED IN A VEHICLE, CARE MUST BE TAKEN ON INSTALLATION IN VEHICLES FITTED WITH ELECTRONIC ENGINE MANAGEMENT SYSTEMS AND ANTI-SKID BRAKING SYSTEMS. UNDER CERTAIN FAULT CONDITIONS, EMITTED RF ENERGY CAN AFFECT THEIR OPERATION. IF NECESSARY, CONSULT THE VEHICLE DEALER/ MANUFACTURER TO DETERMINE THE IMMUNITY OF VEHICLE ELECTRONIC SYSTEMS TO RF ENERGY.
- THE PRODUCT MUST NOT BE OPERATED IN AREAS LIKELY TO CONTAIN POTENTIALLY EXPLOSIVE ATMOSPHERES, FOR EXAMPLE, PETROL STATIONS (SERVICE STATIONS), BLASTING AREAS ETC.
- OPERATION OF ANY RADIO TRANSMITTING EQUIPMENT, INCLUDING CELLULAR TELEPHONES, MAY INTERFERE WITH THE FUNCTIONALITY OF INADEQUATELY PROTECTED MEDICAL DEVICES. CONSULT A PHYSICIAN OR THE MANUFACTURER OF THE MEDICAL DEVICE IF YOU HAVE ANY QUESTIONS. OTHER ELECTRONIC EQUIPMENT MAY ALSO BE SUBJECT TO INTERFERENCE.
- BEFORE MAKING ANY TEST CONNECTIONS, MAKE SURE YOU HAVE SWITCHED OFF ALL EQUIPMENT.

Cautions

- Servicing and alignment must be undertaken by qualified personnel only.
- Ensure all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
- Ensure solder, wire, or foreign matter does not enter the telephone as damage may result.
- Use only approved components as specified in the parts list.
- Ensure all components, modules, screws and insulators are correctly re-fitted after servicing and alignment.
- Ensure all cables and wires are repositioned correctly.
- Never test a mobile phone WCDMA transmitter with full Tx power, if there is no possibility to perform the measurements in a good performance RF-shielded room. Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.
- During testing never activate the GSM or WCDMA transmitter without a proper antenna load, otherwise GSM or WCDMA PA may be damaged.

Copyright © 2008 Nokia. All rights reserved.

ESD protection

Nokia requires that service points have sufficient ESD protection (against static electricity) when servicing the phone.

Any product of which the covers are removed must be handled with ESD protection. The SIM card can be replaced without ESD protection if the product is otherwise ready for use.

To replace the covers ESD protection must be applied.

All electronic parts of the product are susceptible to ESD. Resistors, too, can be damaged by static electricity discharge.

All ESD sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD protected spare part packages MUST NOT be opened/closed out of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Nokia After Market Services representative.

Copyright © 2008 Nokia. All rights reserved.

Care and maintenance

This product is of superior design and craftsmanship and should be treated with care. The suggestions below will help you to fulfil any warranty obligations and to enjoy this product for many years.

- Keep the phone and all its parts and accessories out of the reach of small children.
- Keep the phone dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the phone in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the phone in hot areas. High temperatures can shorten the life of electronic devices, damage batteries, and warp or melt certain plastics.
- Do not store the phone in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the phone. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the phone.
- Do not paint the phone. Paint can clog the moving parts and prevent proper operation.
- Use only the supplied or an approved replacement antenna. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, battery, charger or any accessory.

Copyright © 2008 Nokia. All rights reserved.

Company Policy

Our policy is of continuous development; details of all technical modifications will be included with service bulletins.

While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, NOKIA MOBILE PHONES Business Group should be notified in writing/e-mail.

Please state:

- Title of the Document + Issue Number/Date of publication
- Latest Amendment Number (if applicable)
- Page(s) and/or Figure(s) in error

Please send to:

NOKIA CORPORATION
Nokia Mobile Phones Business Group
Nokia Customer Care
PO Box 86
FIN-24101 SALO
Finland
E-mail: Service.Manuals@nokia.com

Copyright © 2008 Nokia. All rights reserved.

Battery information

Note: A new battery's full performance is achieved only after two or three complete charge and discharge cycles!

The battery can be charged and discharged hundreds of times but it will eventually wear out. When the operating time (talk-time and standby time) is noticeably shorter than normal, it is time to buy a new battery.

Use only batteries approved by the phone manufacturer and recharge the battery only with the chargers approved by the manufacturer. Unplug the charger when not in use. Do not leave the battery connected to a charger for longer than a week, since overcharging may shorten its lifetime. If left unused a fully charged battery will discharge itself over time.

Temperature extremes can affect the ability of your battery to charge.

For good operation times with Li-Ion batteries, discharge the battery from time to time by leaving the product switched on until it turns itself off (or by using the battery discharge facility of any approved accessory available for the product). Do not attempt to discharge the battery by any other means.

Use the battery only for its intended purpose.

Never use any charger or battery which is damaged.

Do not short-circuit the battery. Accidental short-circuiting can occur when a metallic object (coin, clip or pen) causes direct connection of the + and - terminals of the battery (metal strips on the battery) for example when you carry a spare battery in your pocket or purse. Short-circuiting the terminals may damage the battery or the connecting object.

Leaving the battery in hot or cold places, such as in a closed car in summer or winter conditions, will reduce the capacity and lifetime of the battery. Always try to keep the battery between 15°C and 25°C (59°F and 77°F). A phone with a hot or cold battery may temporarily not work, even when the battery is fully charged. Batteries' performance is particularly limited in temperatures well below freezing.

Do not dispose of batteries in a fire!

Dispose of batteries according to local regulations (e.g. recycling). Do not dispose as household waste.

Copyright © 2008 Nokia. All rights reserved.

Nokia N96; L3&4 Service Manual Structure

1 General Information
2 Service Tools and Service Concepts
3 BB Troubleshooting and Tuning Guide
4 RF troubleshooting
5 Camera Module Troubleshooting
6 TV troubleshooting
7 System Module
Glossary

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

1 — General Information

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Product selection 1–5
Product features and sales package 1–5
Mobile enhancements 1–8
Technical specifications 1–10
Transceiver general specifications 1–10
Main RF characteristics for GSM850/900/1800/1900 and WCDMA VIII (900) and WCDMA I (2100) phones 1–10
Battery endurance 1–12

List of Tables

Table 1 Audio 1–8
Table 2 Car 1–9
Table 3 Data 1–9
Table 4 GPS 1–10
Table 5 Messaging 1–10
Table 6 Power 1–10
Table 7 Carrying 1–10

List of Figures

Figure 1 View of RM-247 1–5

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Product selection

RM-247 is a WCDMA/GSM dual mode handportable phone, supporting EGSM850/900/1800/1900, WCDMA 2100/900 and DVB-H.

RM-247 is a 3GPP Release 5 terminal supporting WCDMA/HSDPA, EGPRS and GPRS data bearers. For WCDMA HSDPA the maximum bit rate is up to 3.6 Mbps for downlink and 384 kbps for uplink with simultaneous CS speech or CS video (max. 64 kbps). For 2G and 2.5G networks the RM-247 is a Class A EGPRS DTM MSC 11 which means a maximum download speed of up to 236.8 kbps simultaneously with speech or Class B EGPRS MSC 32 which means a maximum download speed of up to 296kbit/s with EGPRS, and up to 107kbit/s with GPRS. According to GSM standard 05.05 it responds to class 4 (max. 2W) in GSM 850 and EGSM 900 class 1 (1W) in DCS 1800 and class 1 in PCS 1900. RM-247 supports EGPRS (EDGE) class B as well as Bluetooth 2.0 EDR standard.

RM-247 is an MMS (Multimedia Messaging Service) enabled multimedia computer with a large 2.8'' QVGA (240 x 320 pixels) TFT colour display. The MMS implementation follows the OMA MMS standard release 1.2. The Browser is a highly advanced internet browser also capable of viewing operator domain XHTML Mobile Profile (MP) content.

RM-247 supports two-way video calls with two integrated cameras, one on the front and one on the back. The main camera is a 5 Megapixel auto focus camera. The secondary VGA camera is for video calls.

RM-247 uses Symbian 9.3 operating system and supports MIDP Java 2.0 & CLDC1.1, providing a good platform for compelling 3rd party applications.

Figure 1 View of RM-247

Product features and sales package

Imaging

Main camera:

- Sensor: CMOS, 5 megapixel
- Carl Zeiss Optics: Tessar™ lens
- F number/Aperture: F2.8
- Focal length: 5.2 mm
  31.8 mm (35 mm equiv.)
- Focus range: 10 cm ~ infinity
- Macro focus distance: 10-50 cm

Video:

- Video resolution: up to VGA at 30 fps

Copyright © 2008 Nokia. All rights reserved.

- Audio recording: AAC (AMR for MMS)
- Video stabilization
- Video clip length: 59 min 59 sec
- Video file format: .mp4 (default), .3gp (for MMS)
- White balance: automatic, sunny, cloudy, incandescent, fluorescent
- Scene: Auto, Night
- Colour tone: normal, sepia, B&W, vivid, negative
- Zoom (optical/digital): 1x / up to 10x (VGA 4X)

Photo:

- Still image resolutions: up to 5 megapixel: 2592 x 1944
- Still image file format: JPEG/EXIF
- Auto focus
- Auto exposure: center weighted AE
- Image orientation: automatic
- Exposure compensation: +2 ~ -2EV at 0.5 step
- White balance: automatic, sunny, cloudy, incandescent, fluorescent
- Scene: auto, sports, portrait, close-up, landscape, night, user defined
- Colour tone: normal, sepia, B&W, vivid, negative
- Zoom (digital): up to 20x (5Mpix 6X)

Other camera features:

- LED flash and recording indicator
- Front camera, VGA (640 x 480) sensor

Edit

- On device Photo editor and Video editor (manual & automatic)

View

- Large 2.8” LCD QVGA (240 x 320 pixels) TFT colour display
- Slideshow from Gallery

Share

- Nokia XpressShare - share effortlessly from Gallery or after capture via Email, Bluetooth, MMS or IrDA
- Direct connection to TV via cable or WLAN (UPnP)
- Video call and video sharing support. (WCDMA services)
- Online Album : Image/Video uploading from Gallery

Print

- Nokia XpressPrint – direct printing via USB (PictBridge), Bluetooth (BPP), and WLAN (UPnP), from memory card or via online printing

Store

- Nokia XpressTransfer – easy to transfer and organize photos and video between your device and a compatible PC

Copyright © 2008 Nokia. All rights reserved.

- Photoshop Album 3.0 Starter Edition (PC)
- Nokia Lifeblog (mobile & PC)

Music

- Digital music player: supports MP3/AAC/M4A/WMA with playlists
- Dedicated music keys
- OMA DRM 2.0 & WMDRM support for music
- Stereo FM radio (87.5-108MHz)
- Integrated stereo handsfree speakers
- Stereo headset HS-45 & music remote AD-54

Media

- Mobile TV experience with video streaming
- Full web browser support (HTML)
- Visual Radio™ support

Productivity

Messaging:

- E-mail (SMTP, IMAP4, POP3), MMS, SMS

Office applications:

- Viewing of email attachments – .doc, .xls, .ppt, . pdf

PIM:

- Contacts, calendar, to-do, notes, recorder, calculator, clock, converter

Synchronization:

- Local/Remote (using SyncML)
  - Data: Calendar, Contacts, To-do, Notes, E-mail
  - PC Applications: Microsoft Outlook (98, 2000, 2002, 2003), Outlook Express, Lotus Organizer (5.0, 6.0), Lotus Notes (5.0, 6.0)

Call management:

- Call logs, speed dial, voice dialling (with SIND) and voice commands
- Nokia Push to Talk (OMA PoC)

Connectivity

- WLAN - IEEE802.11 g/b with UPnP support
- Micro USB type B interface with USB 2.0 full speed
- 3.5mm stereo headphone plug and TV out support (PAL/NTSC)
- Bluetooth wireless technology 2.0 with A2DP stereo audio

Add-on software framework

- Symbian 9.3 OS
- Nokia Series 60, 3rd edition, feature pack 2
- Java: MIDP2.0
- C++ and Java SDKs

Copyright © 2008 Nokia. All rights reserved.

Additional technical specifications

- Vibrating alert
- 3GPP Rel 5 compliant
- Speech codecs supported in WCDMA: AMR
- Speech codecs supported in GSM: FR AMR/HR AMR/EFR/FR/HR
- WCDMA HSDPA 2100 MHz with simultaneous voice and packet data (PS max speed DL/UL= 3.6Mbps/ 384kbps, CS max speed 64kbps)
- Dual Transfer Mode (DTM) support for simultaneous voice and packet data connection in GSM/EDGE networks. Simple class A, multi slot class 11, max speed DL/UL: 118.4/118.4kbits/s
- EGPRS class B, multi slot class 32, (5 Rx + 3 Tx / Max Sum 6), max speed DL/UL= 296 / 177.6 kbits/s
- GPRS class B, multi slot class 32 (5 Rx + 3 Tx / Max Sum 6), max speed DL/UL= 107 / 64.2 kbits/s
- GPS
- DVB-H receiver (470-750MHz)

Sales package

- Transceiver RM-247
- Travel charger (AC-5U)
- Battery (BL-5F)
- Music headset (HS-45)
- Video connectivity cable (CA-75U)
- Micro USB connectivity cable (CA-101)

Mobile enhancements

Table 1 Audio

Enhancement	Type
Music headset	HS-45 with AD-43 3.5mm stereo plug
Basic headset	HS-41
Stereo headset	HS-48
Wireless headset	HS-26W

Copyright © 2008 Nokia. All rights reserved.

Enhancement	Type
Bluetooth headset	BH-900
	BH-800
	STEREO BH-501
	BH-601
	MONO BH-200
	BH-202
	BH-207
	BH-300
	BH-302
	BH-500
	BH-600
	BH-700
	BH-801
Wireless stereo gateway	AD-42W
Music headphone	HS-61
Advanced headphone	HS-62
Music speaker	MD-3
Mini speaker	MD-4

Table 2 Car

Enhancement	Type
Mobile charger	DC-4
Wireless plug-in car handsfree	HF-6W
	HF-33W
	HF-35W
Car kit	Nokia 616
Multimedia car kit	CK-20W

Table 3 Data

Enhancement	Type
Connectivity cable	CA-101
Video connectivity cable	CA-75U
MicroSD card	128MB - 8GB

Copyright © 2008 Nokia. All rights reserved.

Table 4 GPS

Enhancement	Type
Wireless GPS module	LD-4W
Navigation pack	LD-2

Table 5 Messaging

Enhancement	Type
Digital pen	SU-27W
Wireless keyboard	SU-8W

Table 6 Power

Enhancement	Type
Battery 950mAh Li-ion	BL-5F
Travel charger	AC-5U
Charger adapter	CA-44

Table 7 Carrying

Enhancement	Type
Carrying case	

Technical specifications

Transceiver general specifications

Unit	Dimensions (L x W x T) (mm)	Weight (g)	Volume (cm3)
Transceiver with BL-5F 950mAh li-ion battery back	99 x 53 x 19-21	~ 120	90

Main RF characteristics for GSM850/900/1800/1900 and WCDMA VIII (900) and WCDMA I (2100) phones

Parameter	Unit
Cellular system	GSM850, EGSM900, GSM1800/1900, WCDMA VIII (900) and WCDMA I (2100)

Copyright © 2008 Nokia. All rights reserved.

Parameter	Unit
Rx frequency band	GSM850: 869 - 894 MHz
	EGSM900: 925 - 960 MHz
	GSM1800: 1805 - 1880 MHz
	GSM1900: 1930 - 1990 MHz
	WCDMA VIII (900): 925- 960 MHz
	WCDMA I (2100): 2110 - 2170 MHz
Tx frequency band	GSM850: 824 - 849 MHz
	EGSM900: 880 - 915 MHz
	GSM1800: 1710 - 1785 MHz
	GSM1900: 1850 - 1910 MHz
	WCDMA VIII (900): 880 - 915 MHz
	WCDMA I (2100): 1920 - 1980 MHz
Output power	GSM850: +5 ...+33dBm/3.2mW ... 2W
	GSM900: +5 ... +33dBm/3.2mW ... 2W
	GSM1800: +0 ... +30dBm/1.0mW ... 1W
	GSM1900: +0 ... +30dBm/1.0mW ... 1W
	WCDMA VIII (900): -50 ... +24 dBm/0.01µW ... 251.2mW
	WCDMA I (2100): -50 ... +24 dBm/0.01µW ... 251.2mW
EDGE output power	EDGE850: +5 ... +29dBm/3.2mW ... 794mW
	EDGE900: +5 ... +29dBm/3.2mW ... 794mW
	EDGE1800: +0 ... +26dBm/1.0mW ... 400mW
	EDGE1900:+0 ... +26dBm/1.0mW ... 400mW
Number of RF channels	GSM850: 124
	GSM900: 174
	GSM1800: 374
	GSM1900: 299
	WCDMA VIII (900): 152
	WCDMA I (2100): 277
Channel spacing	200 kHz

Copyright © 2008 Nokia. All rights reserved.

Parameter	Unit
Number of Tx power levels	GSM850: 15
	GSM900: 15
	GSM1800: 16
	GSM1900: 16
	WCDMA VIII (900): 75
	WCDMA I (2100): 75

Battery endurance

Battery	Capacity (mAh)	Talk time	Stand-by
BL-5F	950	up to 160 min (WCDMA) up to 210 min (GSM)	up to 215 h (WCDMA & GSM)

Charging times

AC-5
1h 30 min

Copyright © 2008 Nokia. All rights reserved.

2 — Service Tools and Service Concepts

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Service tools 2–5
CU-4 2–6
FLS-5 2–7
FPS-10 2–7
FPS-21 2–8
FS-51 2–9
MJ-131 2–9
PK-1 2–9
RJ-104 2–10
RJ-105 2–10
RJ-157 2–10
RJ-159 2–10
RJ-160 2–11
RJ-169 2–11
RJ-230 2–11
RJ-93 2–11
SA-141 2–12
SB-6 2–12
SB-7 2–12
SS-100 2–12
SS-46 2–12
SS-62 2–13
SS-93 2–13
ST-37 2–13
ST-38 2–13
ST-40 2–13
ST-53 2–14
ST-55 2–14
ST-59 2–14
SX-4 2–14
Cables 2–14
CA-101 2–15
CA-112DS 2–15
CA-128RS 2–15
CA-31D 2–16
CA-35S 2–16
CA-89DS 2–16
PCS-1 2–17
XCS-4 2–17
XRF-1 2–17
XRS-6 2–17
Service concepts 2–18
POS (Point of Sale) flash concept 2–18
Flash concept with FPS-10 2–19
CU-4 flash concept with FPS-10 2–20
Flash concept with FPS-10 and JBT-9 2–21
Flash concept with SS-46 and CA-89DS 2–22
Flash concept with SS-62 and CA-89DS 2–23
Flash concept with FPS-10, SS-62 and JBT-9 2–24
Flash concept with FPS-10, SS-62 and SB-7 2–25

Copyright © 2008 Nokia. All rights reserved.

Module jig service concept 2–26
Module jig service concept with JBT-9 and smart card reader 2–27
Module jig service concept with JBT-9 2–28
RF testing concept with RF coupler 2–29
Service concept for RF testing and RF/BB tuning 2–30

List of Tables

Table 8 Attenuation values 2–15

List of Figures

Figure 2 Basic flash concept with FPS-10 2–19
Figure 3 CU-4 flash concept with FPS-10 2–20
Figure 4 Flash concept with FPS-10 and JBT-9 2–21
Figure 5 Flash concept with SS-46 and CA-89DS 2–22
Figure 6 Flash concept with SS-62 and CA-89DS 2–23
Figure 7 Flash concept with FPS-10, SS-62 and JBT-9 2–24
Figure 8 Flash concept with FPS-10, SB-7 and JBT-9 2–25
Figure 9 Module jig service concept 2–26
Figure 10 Service concept with JBT-9 and smart card reader 2–27
Figure 11 Module jig service concept with JBT-9 2–28
Figure 12 RF testing concept with RF coupler 2–29
Figure 13 Service concept for RF testing and RF/BB tuning 2–30

Copyright © 2008 Nokia. All rights reserved.

Service tools

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-247. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

Copyright © 2008 Nokia. All rights reserved.

CU-4	Control unit	

CU-4 is a general service tool used with a module jig and/or a flash adapter. It requires an external 12 V power supply.

The unit has the following features:

- software controlled via USB
- EM calibration function
- Forwards FBUS/Flashbus traffic to/from terminal
- Forwards USB traffic to/from terminal
- software controlled BSI values
- regulated VBATT voltage
- 2 x USB2.0 connector (Hub)
- FBUS and USB connections supported

When using CU-4, note the special order of connecting cables and other service equipment:

Instructions

1 Connect a service tool (jig, flash adapter) to CU-4.
2 Connect CU-4 to your PC with a USB cable.
3 Connect supply voltage (12 V)
4 Connect an FBUS cable (if necessary).
5 Start Phoenix service software.

Note: Phoenix enables CU-4 regulators via USB when it is started.

Reconnecting the power supply requires a Phoenix restart.

Copyright © 2008 Nokia. All rights reserved.

FLS-5	Flash device	

FLS-5 is a dongle and flash device incorporated into one package, developed specifically for POS use.

Note: FLS-5 can be used as an alternative to PKD-1.

FPS-10	Flash prommer	

FPS-10 interfaces with:

- PC
- Control unit
- Flash adapter
- Smart card

FPS-10 flash prommer features:

- Flash functionality for BB5 and DCT-4 terminals
- Smart Card reader for SX-2 or SX-4
- USB traffic forwarding
- USB to FBUS/Flashbus conversion
- LAN to FBUS/Flashbus and USB conversion
- Vusb output switchable by PC command

FPS-10 sales package includes:

- FPS-10 prommer
- Power Supply with 5 country specific cords
- USB cable

Note: FPS-21 is substitute FPS-10 if FPS-10 has not been set up.

Copyright © 2008 Nokia. All rights reserved.

FPS-21	Flash prommer	

FPS-21 sales package:

- FPS-21 prommer
- AC-35 power supply
- CA-31D USB cable

FPS-21 interfaces:

Front

- Service cable connector

  Provides Flashbus, USB and VBAT connections to a mobile device.
- SmartCard socket

  A SmartCard is needed to allow DCT-4 generation mobile device programming.

Rear

- DC power input

  For connecting the external power supply (AC-35).
- Two USB A type ports (USB1/USB3)

  Can be used, for example, for connecting external storage memory devices or mobile devices
- One USB B type device connector (USB2)

  For connecting a PC.
- Phone connector

  Service cable connection for connecting Flashbus/FLA.
- Ethernet RJ45 type socket (LAN)

  For connecting the FPS-21 to LAN.

Inside

- Four SD card memory slots

  For internal storage memory.

  Note: In order to access the SD memory card slots inside FPS-21, the prommer needs to be opened by removing the front panel, rear panel and heatsink from the prommer body.

  Note: FPS-10 can be used for flashing instead of FPS-21 if necessary.

Copyright © 2008 Nokia. All rights reserved.

FS-51	Flash adapter	

Flash adapter FS-51 is used for phone testing and flashing. FS-51 is used with the generic flash adapter base SS-60/62 and control unit CU-4 or interface adapter SS-46.

When flashing or system testing the phone, the adapter is attached to replace the phone own battery.

All functions (as well as the calibration voltages, current and the protections for over voltages, over current and voltage polarity), are performed by CU-4.

Flash adapter FS-51 main features:

- VBATT supply interface
- USB / FBUS multiplexed interface to the phone

MJ-131	Module jig	

MJ-131 can be used for flashing as well as for RF, battery and system testing.

MJ-131 main functions:

- CU-4 interface adapter to phone
- FBUS interface to phone
- UI Interface to phone
- WCDMA and GSM RF-interface

All functions are performed in CU-4 e.g. calibration voltages and currents both all protections (over current, over voltage and voltage polarity).

MJ-131 contains following interfaces to phone:

- VBATT interface
- UI interface containing Display connector
- WCDMA and GSM RF interfaces
- Bluetooth RF interface
- Earpiece interface
- IHF speaker interface
- Microphone interface

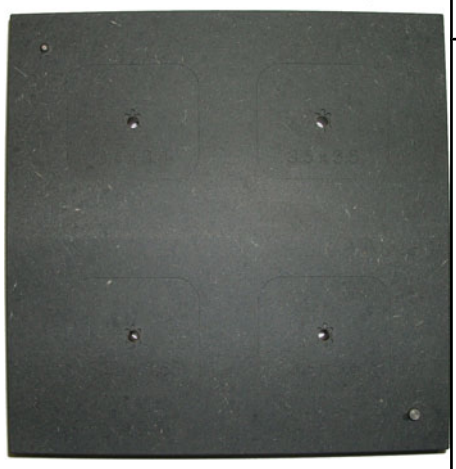
PK-1	Software protection key	

PK-1 is a hardware protection key with a USB interface. It has the same functionality as the PKD-1 series dongle.

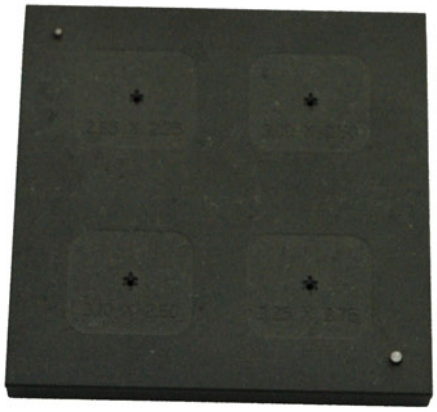
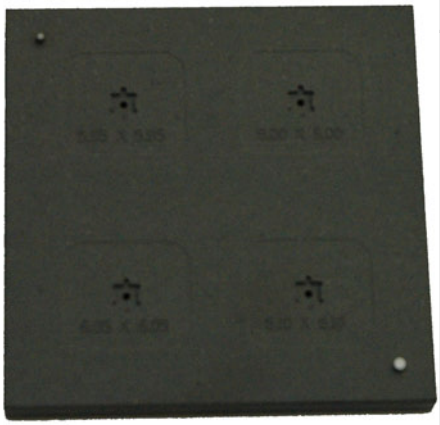
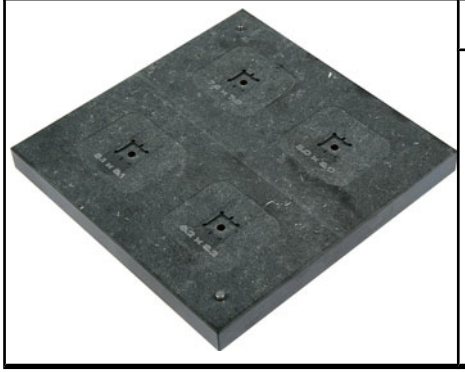
PK-1 is meant for use with a PC that does not have a series interface.

To use this USB dongle for security service functions please register the dongle in the same way as the PKD-1 series dongle.

Copyright © 2008 Nokia. All rights reserved.

	RJ-104	Rework jig	
	RJ-104 is a rework jig used when servicing the BTHFM module. It is used together with rework stencil ST-37.		
	RJ-105	Rework jig	
	RJ-105 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-38 stencil.		
	RJ-157	Rework jig	
	RJ-157 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-55 stencil.		
	RJ-159	Rework jig	
	RJ-159 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-53 stencil.		

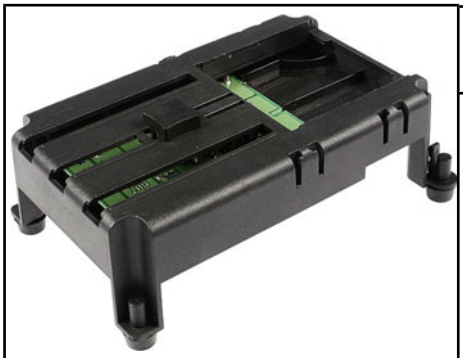
Copyright © 2008 Nokia. All rights reserved.

	RJ-160	Rework jig	
	RJ-160 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-55 stencil.		
	RJ-169	Rework jig	
	RJ-169 is a jig used for soldering and as a rework jig for the engine module. It is used together with the ST-59 stencil.		
	RJ-230	Soldering jig	
	RJ-230 is a soldering jig used for soldering and as a rework jig for the engine module.		
	RJ-93	Rework jig	
	RJ-93 is a rework jig used with ST-40.		

Copyright © 2008 Nokia. All rights reserved.

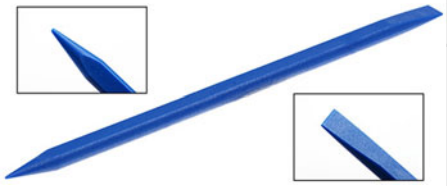
	SA-141	RF coupler	
	SA-141 is an RF coupler for WCDMA and GSM RF testing. It is used together with the product-specific flash adapter.		
	SB-6	Bluetooth tester	
	The SB-6 test box is a generic device to perform Bluetooth bit error rate testing and doing cordless FBUS connection via Bluetooth.		
	SB-7	WLAN test box	
	WLAN test requires defined position for the device.		
	SS-100	Camera removal tool	
	The camera removal tool SS-100 is used to remove/attach a camera module from/to the camera socket of the phone PWB.		
	SS-46	Interface adapter	
	SS-46 acts as an interface adapter between the flash adapter and FPS-10.		

Copyright © 2008 Nokia. All rights reserved.



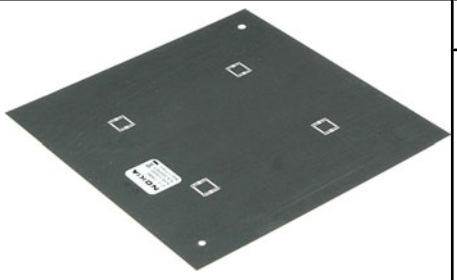
SS-62	Generic flash adapter base for BB5	

- generic base for flash adapters and couplers
- SS-62 equipped with a clip interlock system
- provides standardised interface towards Control Unit
- provides RF connection using galvanic connector or coupler
- multiplexing between USB and FBUS media, controlled by VUSB



SS-93	Opening tool	

SS-93 is used for opening JAE connectors.

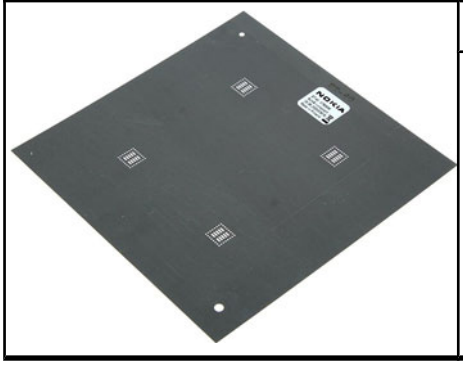


ST-37	BTHFM rework stencil	

ST-37 stencil is used with RJ-104 BTHFM rework jig.

ST-38	Rework stencil	

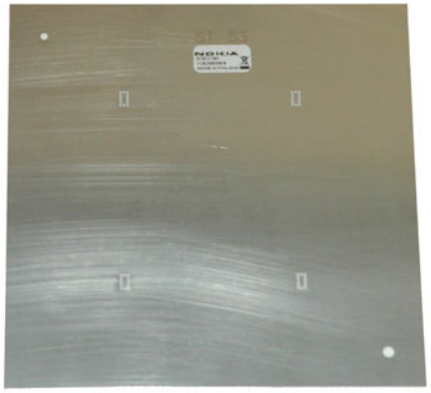
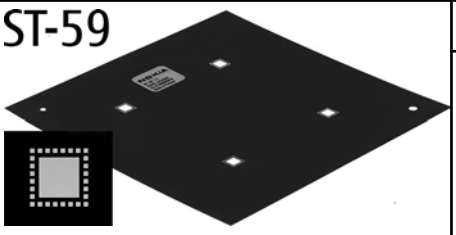
ST-38 is a rework stencil used with rework jig RJ-105.



ST-40	Rework stencil	

ST-40 is a rework stencil and used with RJ-93.

Copyright © 2008 Nokia. All rights reserved.

	ST-53	Rework stencil	
	ST-53 is a rework stencil used with rework jig RJ-166.		
	ST-55	Rework stencil	
	ST-55 is a rework stencil used with rework jig RJ-157 and RJ-160.		
	ST-59	Rework stencil	
	ST-59 is a rework stencil used with rework jig RJ-169.		
	SX-4	Smart card	
	SX-4 is a BB5 security device used to protect critical features in tuning and testing. SX-4 is also needed together with FPS-10 when DCT-4 phones are flashed.		

Cables

The table below gives a short overview of service devices that can be used for testing, error analysis, and repair of product RM-247. For the correct use of the service devices, and the best effort of workbench setup, please refer to various concepts.

Copyright © 2008 Nokia. All rights reserved.

CA-101	Micro USB cable	

The CA-101 is a USB-to-microUSB data cable that allows connections between the PC and the phone.

CA-112DS	Easy flash II cable	

The CA-112DS easy flash II cable is used for connecting phone DC port to the PROMMER facilities (FLS-5, FPS-20).

CA-128RS	RF tuning cable	

Product-specific adapter cable for RF tuning.

- **Table 8 Attenuation values**

Band	Attenuation Rx/Tx
GSM850/900	0.2...0.3 dB
GSM1800/1900	0.3...0.4 dB
WCDMA850	0.2...0.3 dB
WCDMA2100	0.4...0.6 dB

Copyright © 2008 Nokia. All rights reserved.

CA-31D	USB cable	
The CA-31D USB cable is used to connect FPS-10 or FPS-11 to a PC. It is included in the FPS-10 and FPS-11 sales packages.		

CA-35S	Power cable	
CA-35S is a power cable for connecting, for example, the FPS-10 flash prommer to the Point-Of-Sales (POS) flash adapter.		

CA-89DS	Cable	
Provides VBAT and Flashbus connections to mobile device programming adapters.		

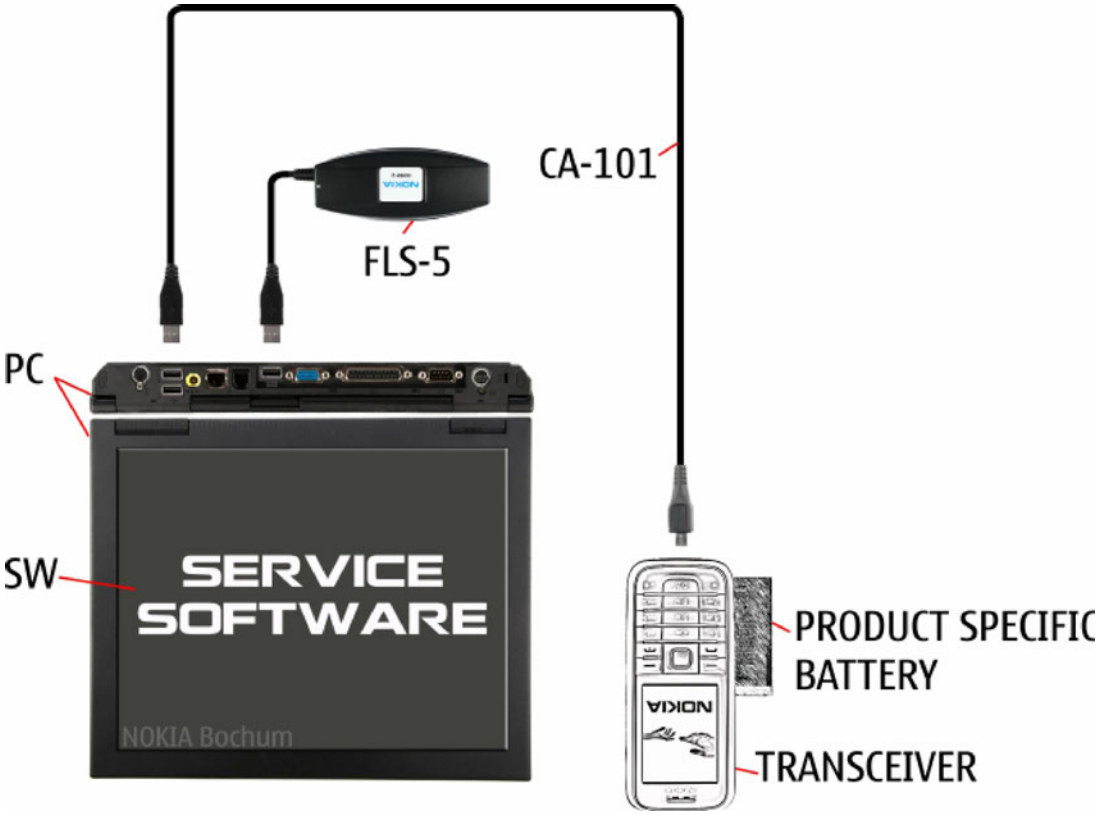
Copyright © 2008 Nokia. All rights reserved.

	PCS-1	Power cable	
	The PCS-1 power cable (DC) is used with a docking station, a module jig or a control unit to supply a controlled voltage.		
	XCS-4	Modular cable	
	XCS-4 is a shielded (one specially shielded conductor) modular cable for flashing and service purposes.		
	XRF-1	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector ca. 610mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		
	XRS-6	RF cable	
	The RF cable is used to connect, for example, a module repair jig to the RF measurement equipment. SMA to N-Connector approximately 610 mm. Attenuation for: • GSM850/900: 0.3+-0.1 dB • GSM1800/1900: 0.5+-0.1 dB • WLAN: 0.6+-0.1dB		

Copyright © 2008 Nokia. All rights reserved.

Service concepts

POS (Point of Sale) flash concept



Type	Description
Product specific tools	
BL-5F	Battery
Other tools	
FLS-5	POS flash dongle
	PC with Phoenix service software
Cables	
CA-101	Micro USB cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with FPS-10

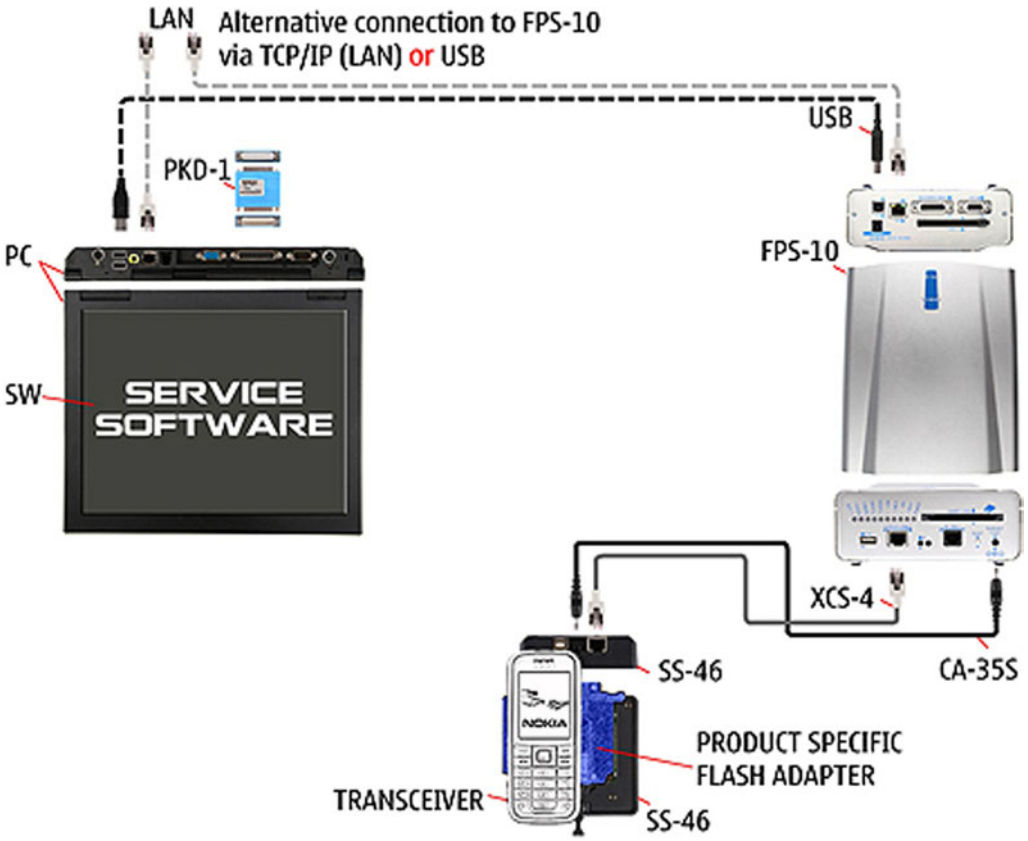


Figure 2 Basic flash concept with FPS-10

Type	Description
Product specific devices	
FS-51	Flash adapter
Other devices	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

CU-4 flash concept with FPS-10

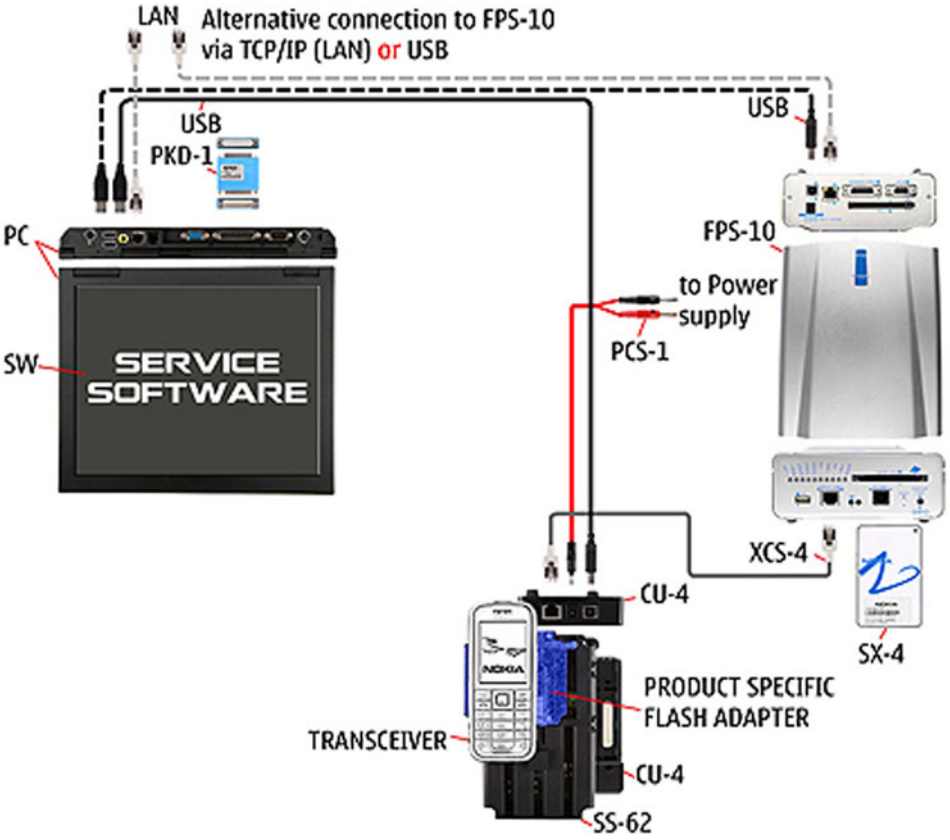


Figure 3 CU-4 flash concept with FPS-10

Type	Description
Product specific devices	
FS-51	Flash adapter
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
PCS-1	Power cable
XCS-4	Modular cable
	Standard USB cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with FPS-10 and JBT-9

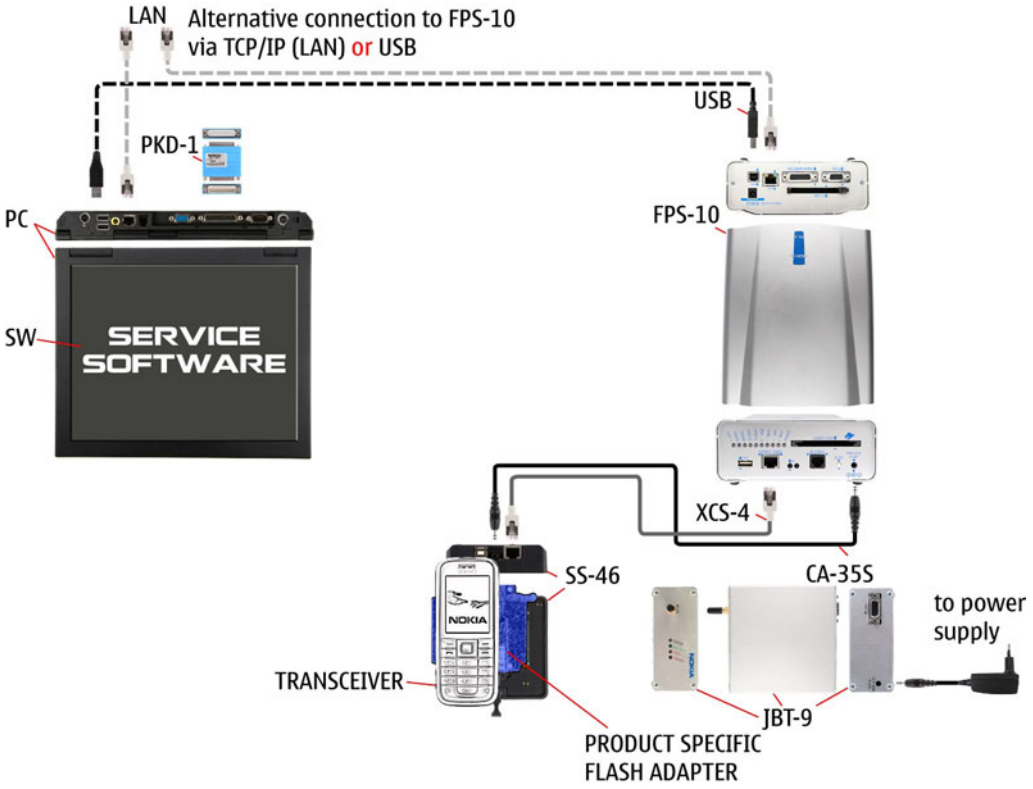


Figure 4 Flash concept with FPS-10 and JBT-9

Type	Description
Product specific tools	
FS-51	Flash adapter
Other tools	
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-46	Interface adapter
JBT-9	Bluetooth test and interface box
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
CA-35S	Power cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with SS-46 and CA-89DS

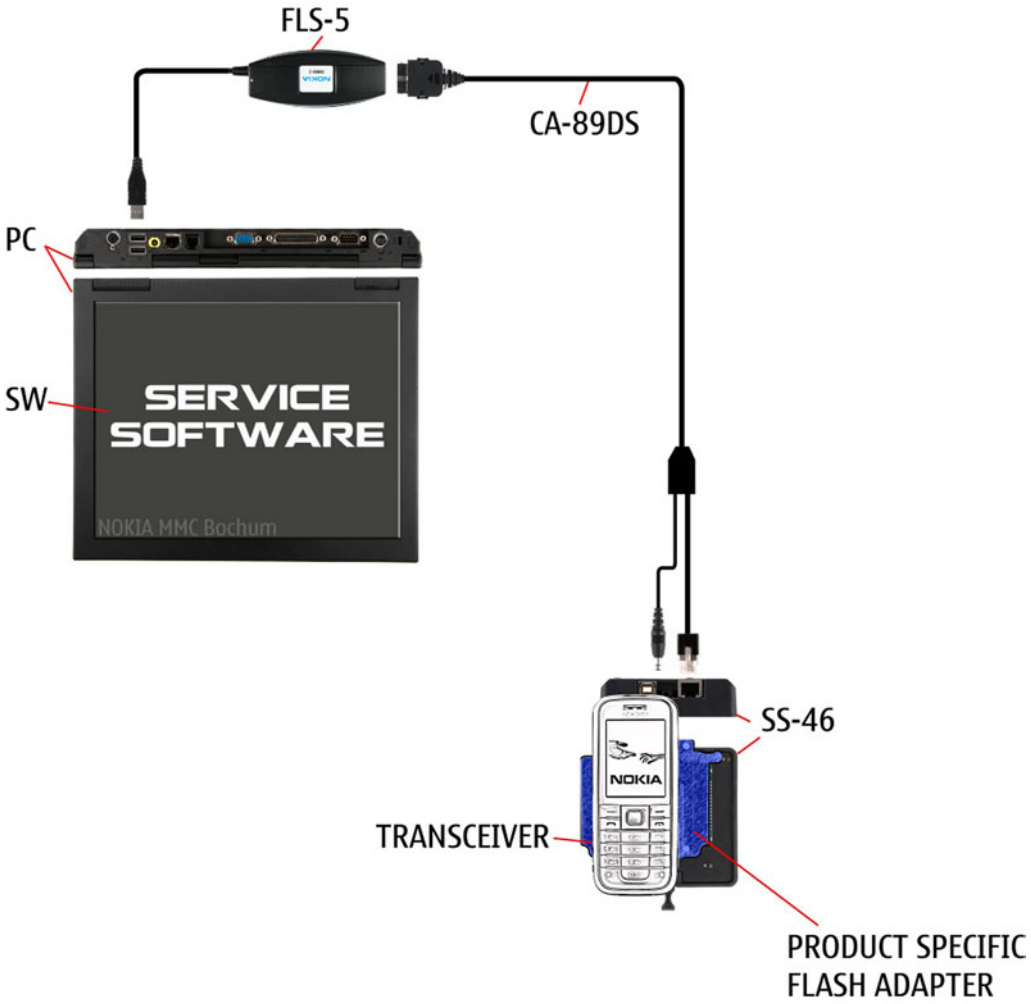


Figure 5 Flash concept with SS-46 and CA-89DS

Type	Description
Product specific tools	
FS-51	Flash adapter
Other tools	
FLS-5	Flash device
SS-46	Interface adapter
	PC with Phoenix service software
Cables	
CA-89DS	Cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with SS-62 and CA-89DS

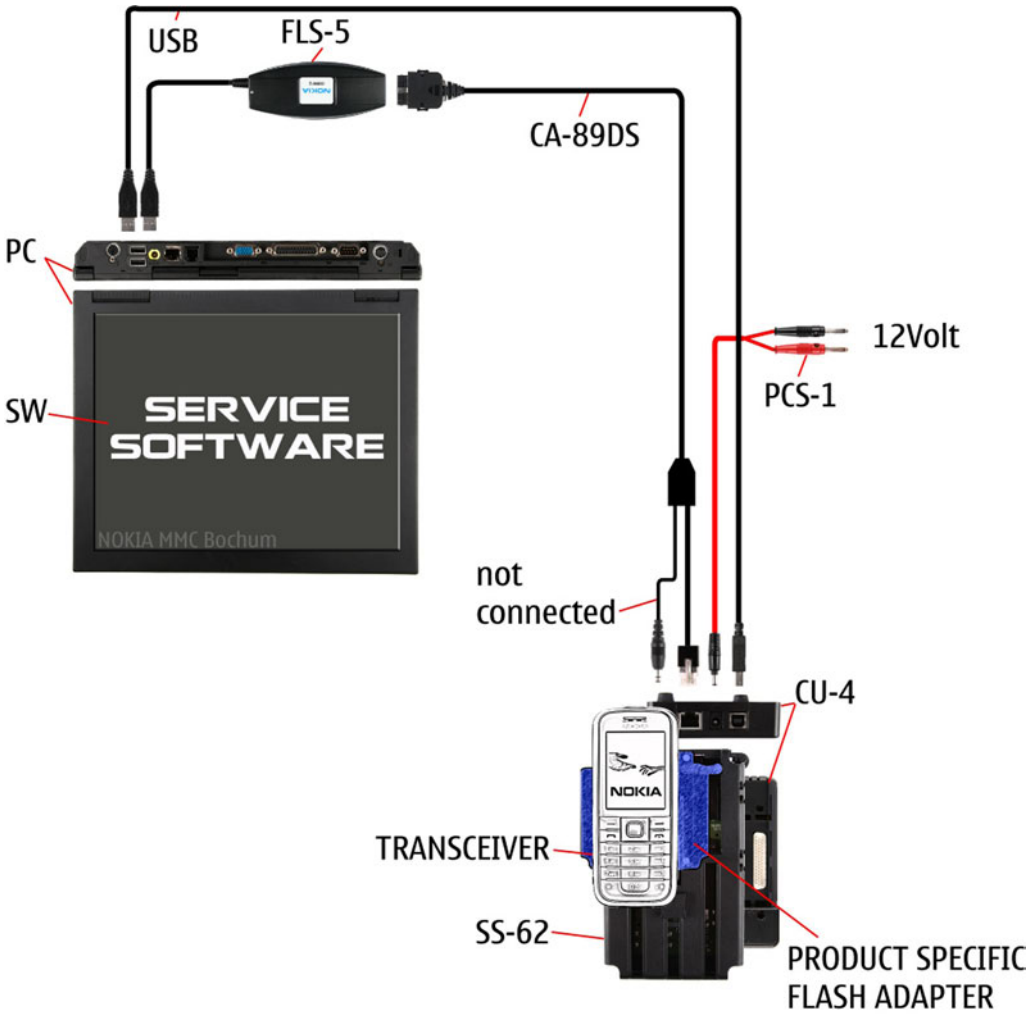


Figure 6 Flash concept with SS-62 and CA-89DS

Type	Description
Product specific tools	
FS-51	Flash adapter
Other tools	
CU-4	Control unit
FLS-5	Flash device
SS-62	Flash adapter base
	PC with Phoenix service software
Cables	
CA-89DS	Cable
PCS-1	Power cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with FPS-10, SS-62 and JBT-9

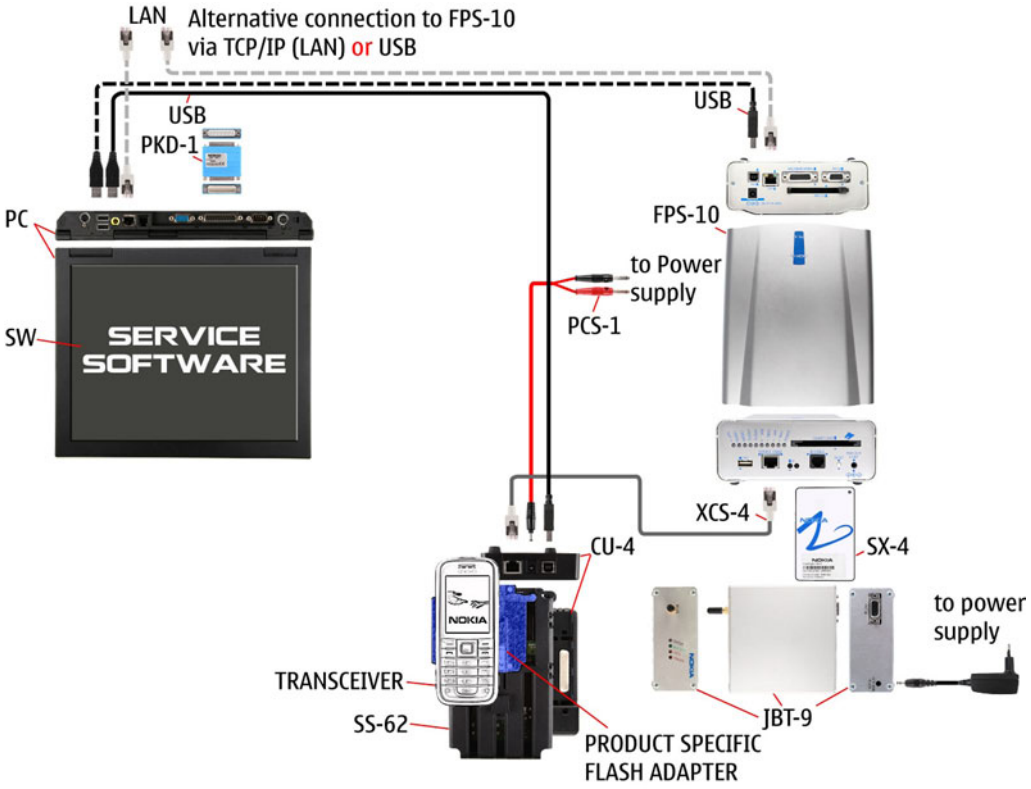


Figure 7 Flash concept with FPS-10, SS-62 and JBT-9

Type	Description
Product specific tools	
FS-51	Flash adapter
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
JBT-9	Bluetooth test and interface box
SX-4	Smart card
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
PCS-1	Power cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Flash concept with FPS-10, SS-62 and SB-7

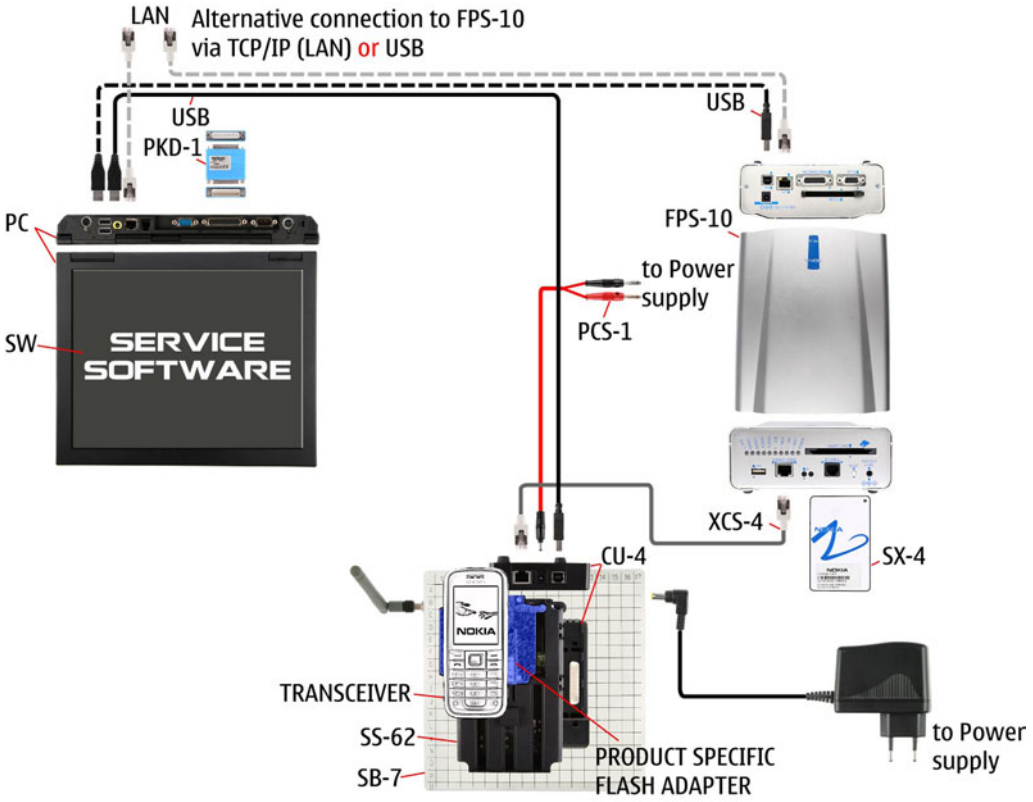


Figure 8 Flash concept with FPS-10, SB-7 and JBT-9

Type	Description
Product specific tools	
FS-51	Flash adapter
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SB-7	WLAN test box
SS-62	Flash adapter base
SX-4	Smart card
	PC with Phoenix service software
Cables	
XCS-4	Modular cable
PCS-1	Power cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Module jig service concept

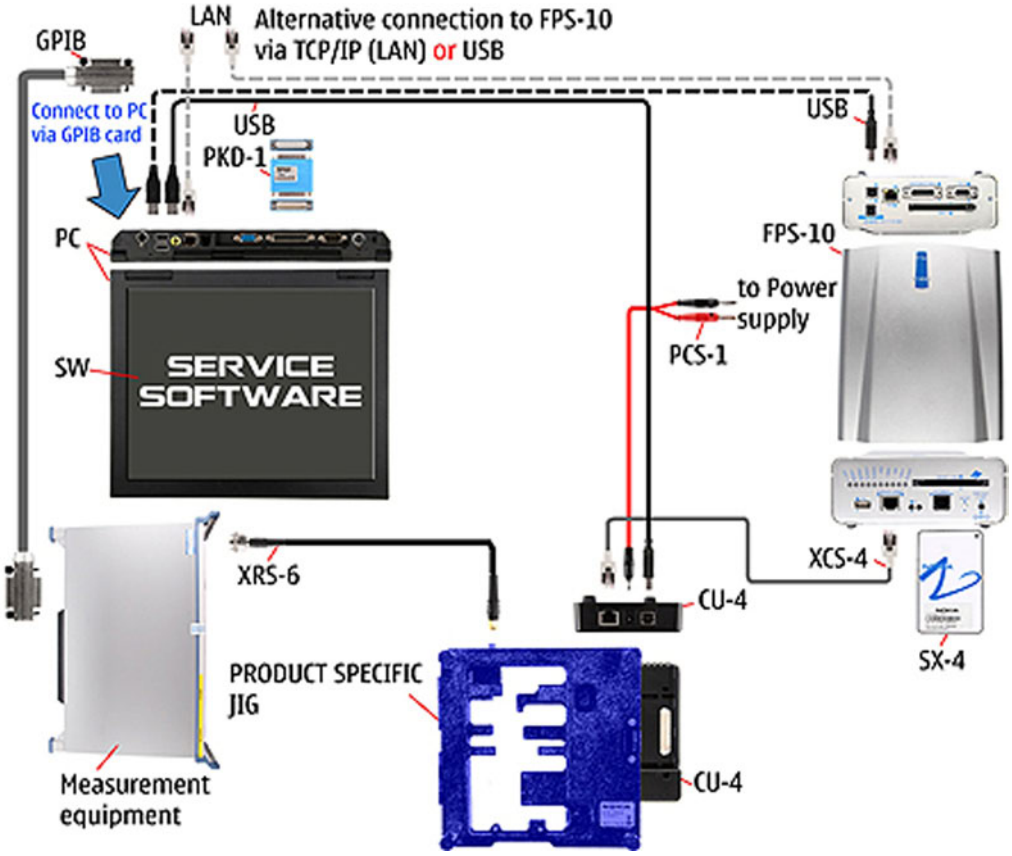


Figure 9 Module jig service concept

Type	Description
Phone specific devices	
MJ-131	Module jig
Other devices	
CU-4	Control unit
FPS-10	Flash prommer box
PK-1	SW security device
SX-4	Smart card
	PC with VPOS and Phoenix service software
	Measurement equipment
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRF-1	RF cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

Type	Description
	GPIB control cable

Module jig service concept with JBT-9 and smart card reader

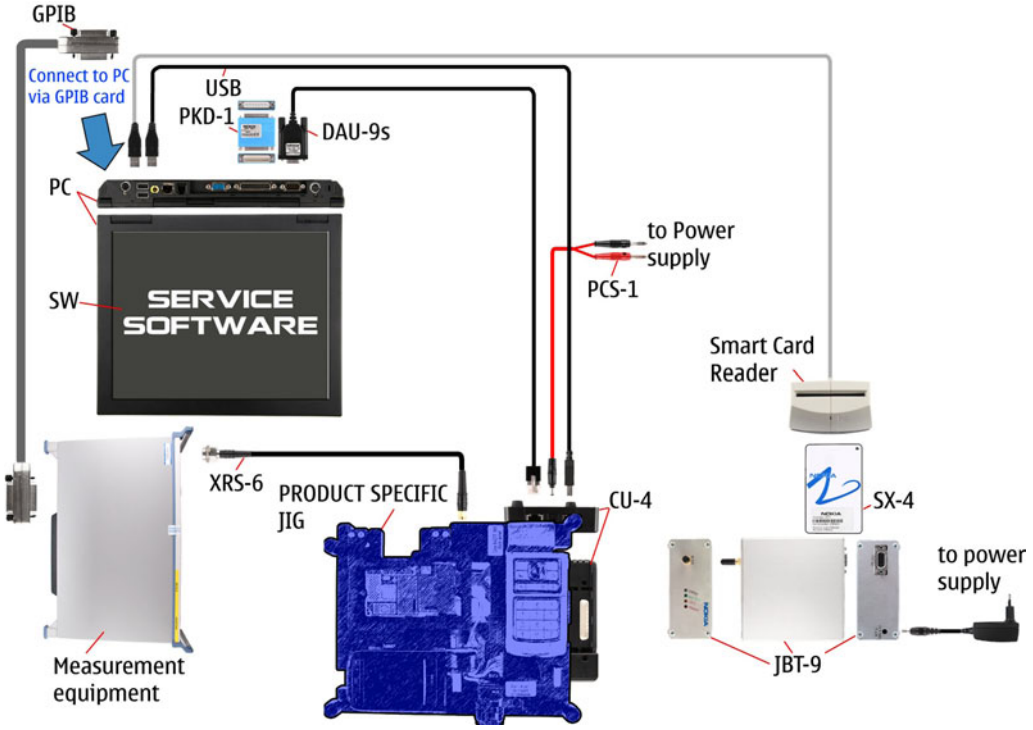


Figure 10 Service concept with JBT-9 and smart card reader

Type	Description
Product specific tools	
MJ-131	Module jig
Other tools	
CU-4	Control unit
JBT-9	Bluetooth test and interface box
PKD-1/PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	PC with Phoenix service software
	Smart card reader
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable

Copyright © 2008 Nokia. All rights reserved.

Type	Description
	USB cable

Module jig service concept with JBT-9

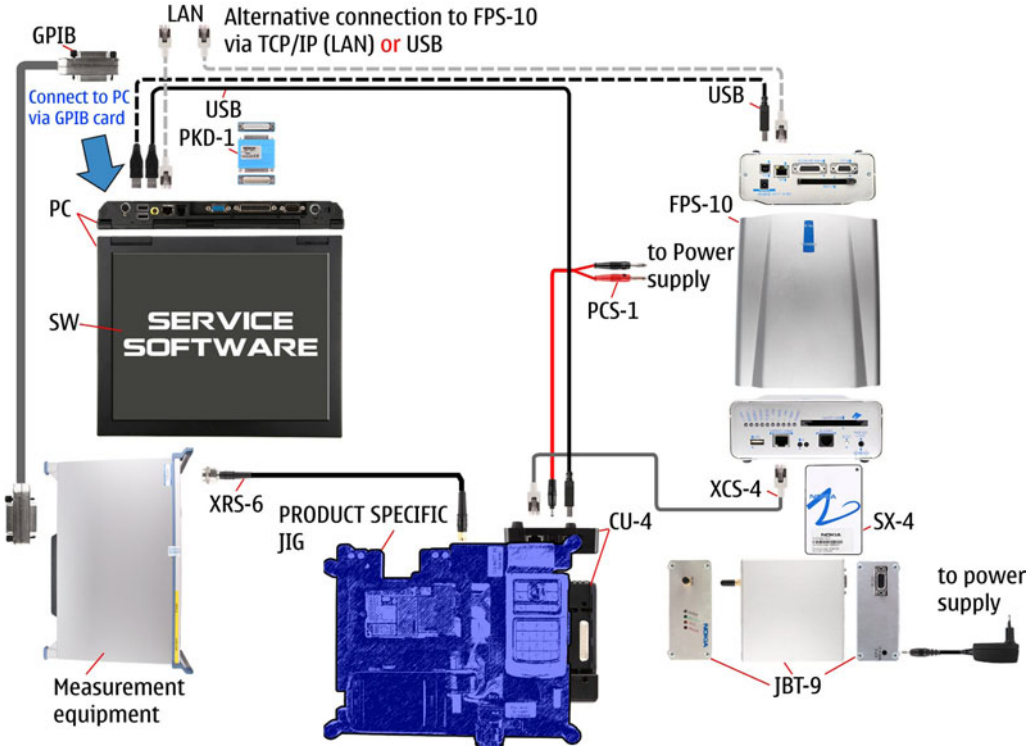


Figure 11 Module jig service concept with JBT-9

Type	Description
Product specific tools	
MJ-131	Module jig
Other tools	
CU-4	Control unit
FPS-10	Flash prommer box
JBT-9	Bluetooth test and interface box
PKD-1	SW security device
SX-4	Smart card
	Measurement equipment
	PC with Phoenix service software
Cables	
PCS-1	DC power cable
XCS-4	Modular cable
XRS-6	RF cable

Copyright © 2008 Nokia. All rights reserved.

Type	Description
	GPIB control cable
	USB cable

RF testing concept with RF coupler

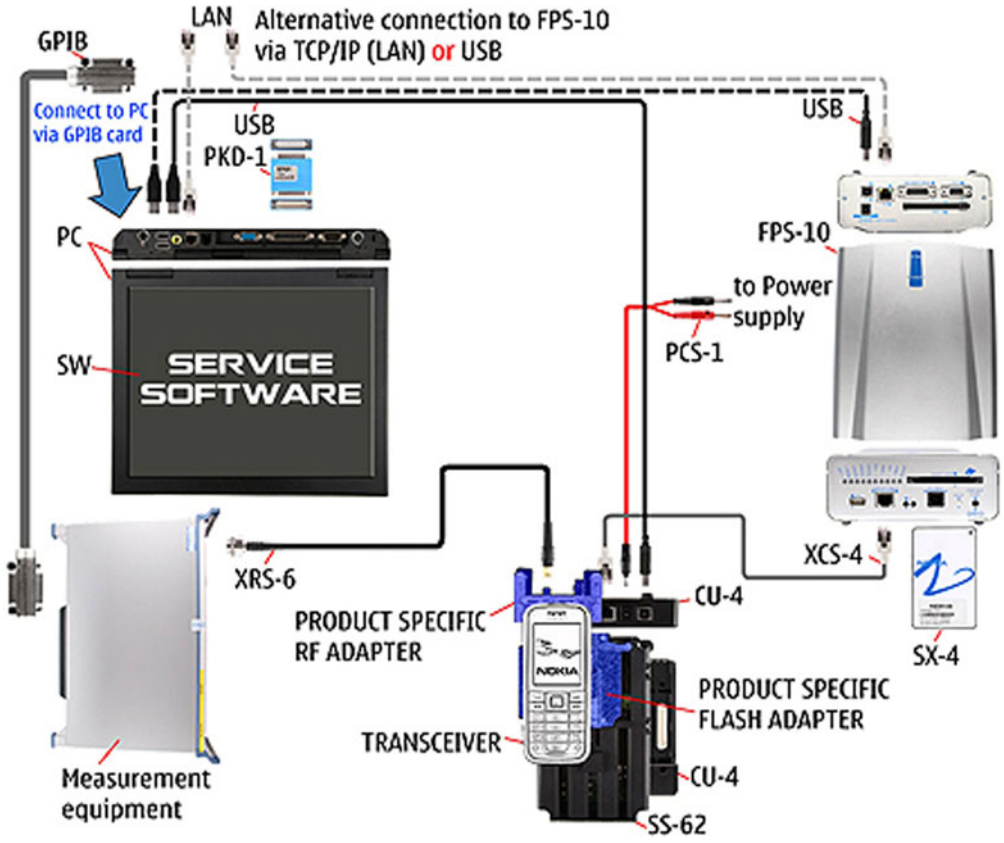


Figure 12 RF testing concept with RF coupler

Type	Description
Product specific devices	
FS-51	Flash adapter
SA-141	RF coupler
Other devices	
CU-4	Control unit
SX-4	Smart card
FPS-10	Flash prommer box
PKD-1/PK-1	SW security device
SS-62	Flash adapter base
	Measurement equipment
	PC with Phoenix service software
Cables	

Copyright © 2008 Nokia. All rights reserved.

Type	Description
PCS-1	Power cable
XCS-4	Modular cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Service concept for RF testing and RF/BB tuning

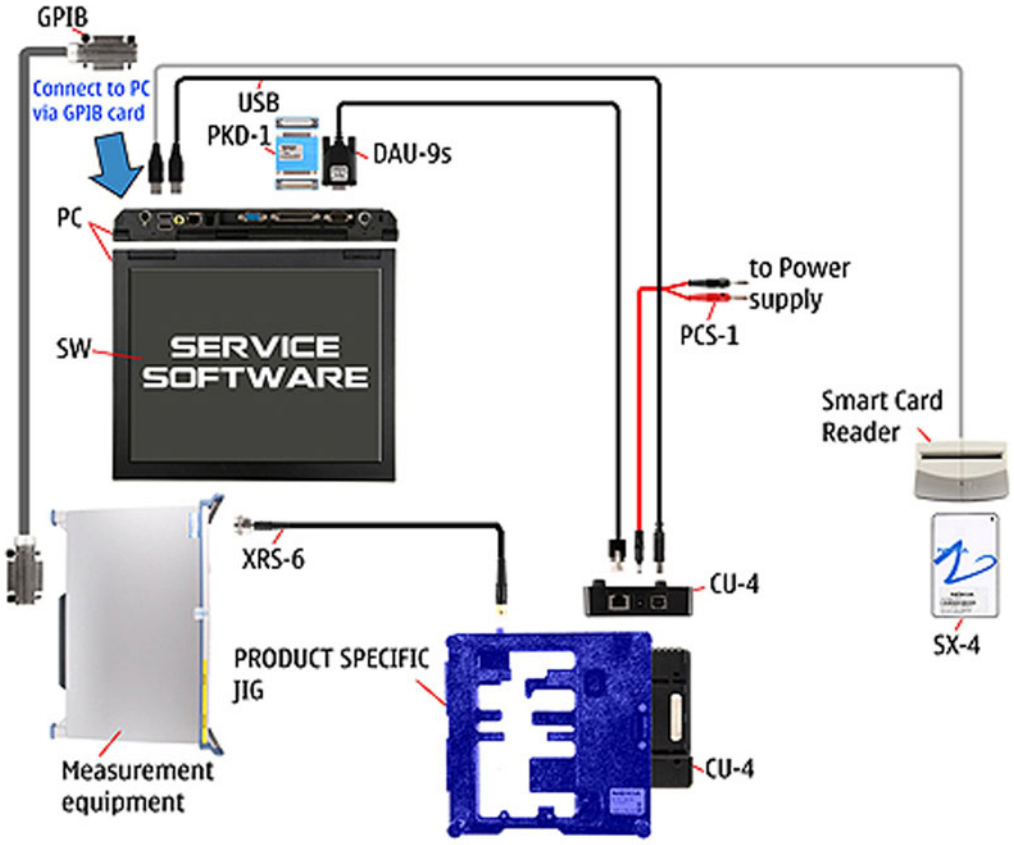


Figure 13 Service concept for RF testing and RF/BB tuning

Type	Description
Product specific devices	
MJ-131	Module jig
Other devices	
CU-4	Control unit
PK-1	SW security device
SX-4	Smart card
	Measurement equipment
	Smart card reader

Copyright © 2008 Nokia. All rights reserved.

Type	Description
	PC with Phoenix service software
Cables	
DAU-9S	MBUS cable
PCS-1	DC power cable
XRS-6	RF cable
	GPIB control cable
	USB cable

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

3 — BB Troubleshooting and Tuning Guide

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Phoenix self test troubleshooting 3–5
Dead or jammed device troubleshooting 3–8
General power checking troubleshooting - CMT 3–9
General power checking troubleshooting - APE 3–10
Clocking troubleshooting 3–11
Application processor troubleshooting 3–12
Charging troubleshooting 3–13
Battery current measuring fault troubleshooting 3–14
Flash programming fault troubleshooting 3–15
LED camera flash troubleshooting 3–18
CMT combo memory fault troubleshooting 3–19
Mass memory troubleshooting 3–20
Application processor memory troubleshooting 3–21
TV-out troubleshooting 3–22
Power key troubleshooting 3–23
Lock key troubleshooting 3–24
High-speed USB interface troubleshooting 3–25
SIM card troubleshooting 3–26
Memory card troubleshooting 3–27
WLAN interface troubleshooting 3–28
Keyboard troubleshooting 3–28
Hall sensor troubleshooting 3–30
FM radio troubleshooting 3–31
Certificate restoring for BB5 products 3–32
GPS troubleshooting 3–38
- GPS layout and basic test points 3–38
- GPS settings for Phoenix 3–38
  - GPS control 3–38
  - Quick Test window 3–39
- GPS RF test points 3–40
- GPS failure troubleshooting 3–41
- GPS basic checks troubleshooting 3–42

Display module troubleshooting 3–44
- General instructions for display troubleshooting 3–44
- Display troubleshooting 3–46
- Display backlight troubleshooting 3–47
- Keypad backlight troubleshooting 3–48
- Accelerometer troubleshooting 3–49
- Backlights controlling in Phoenix 3–49
  - Backlights controlling in Phoenix 3–49
  - Switching display lighting ON using Phoenix 3–49
  - Switching display lighting OFF using Phoenix 3–50
  - Switching S60 keyboard lighting ON using Phoenix 3–51
  - Switching S60 keyboard lighting OFF using Phoenix 3–51
  - Switching ITU (numeric) keyboard lighting ON using Phoenix 3–52
  - Switching ITU (numeric) keyboard lighting OFF using Phoenix 3–53
  - Switching sidemedia keys lighting ON using Phoenix 3–53
  - Switching sidemedia keys lighting OFF using Phoenix 3–54
  - Switching gaming keys lighting ON using Phoenix 3–55
  - Switching gaming keys lighting OFF using Phoenix 3–55

Copyright © 2008 Nokia. All rights reserved.

Switching Navi key lighting ON using Phoenix 3–56
Switching Navi key lighting OFF using Phoenix 3–57
Switching frontmedia key lighting ON using Phoenix 3–57
Switching frontmedia key lighting OFF using Phoenix 3–58
Bluetooth troubleshooting 3–59
Introduction to Bluetooth troubleshooting 3–59
Bluetooth settings for Phoenix 3–60
Bluetooth self tests in Phoenix 3–61
Bluetooth troubleshooting 3–63
Audio troubleshooting 3–64
Audio paths 3–64
Audio loop test 3–64
Internal earpiece troubleshooting 3–65
Internal microphone troubleshooting 3–65
Stereo speakers troubleshooting 3–66
AV stereo output troubleshooting 3–68
AV mono input troubleshooting 3–69
Vibra troubleshooting 3–70
Baseband manual tuning guide 3–70
Energy management calibration 3–70

List of Tables

Table 9 Display module troubleshooting cases 3–44
Table 10 Pixel defects 3–44
Table 11 Audio loop test reference results 3–64
Table 12 Calibration value limits 3–71

List of Figures

Figure 14 Phoenix self test troubleshooting part 1 3–6
Figure 15 Phoenix self test troubleshooting part 2 3–7
Figure 16 Flashing pic 1. Take single triggered measurement for the rise of the BSI signal 3–17
Figure 17 Flashing pic 2. Take single triggered measurement for the rise of the BSI signal 3–17
Figure 18 FM radio placement on the top side 3–31
Figure 19 FM radio placement on the bottom side 3–31
Figure 20 GPS layout and basic test points 3–38
Figure 21 GPS Control dialog box 3–39
Figure 22 GPS Quick Test window for GPS troubleshooting 3–40
Figure 23 GPS antenna test pads 3–40
Figure 24 GPS RF probe points 3–41
Figure 25 Bluetooth placement on the bottom side 3–59
Figure 26 Bluetooth placement on the top side 3–60
Figure 27 BER test result 3–61
Figure 28 Bluetooth self tests in Phoenix 3–62

Copyright © 2008 Nokia. All rights reserved.

Phoenix self test troubleshooting

Context

Always start the troubleshooting procedure by running the Phoenix self tests. If a test fails, please follow the diagrams below.

Copyright © 2008 Nokia. All rights reserved.

Troubleshooting flow

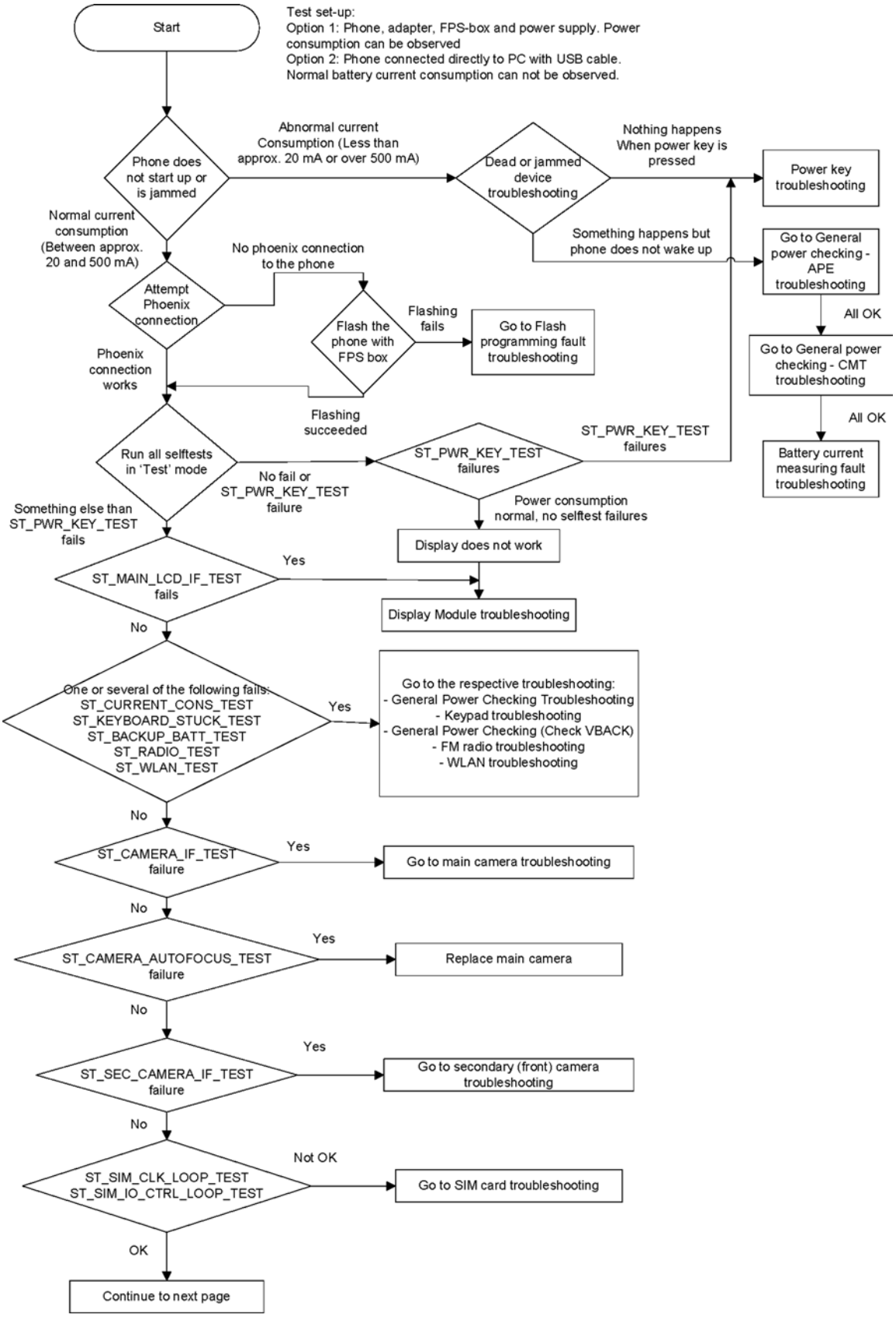

Start
Test set-up:
Option 1: Phone, adapter, FPS-box and power supply. Power consumption can be observed
Option 2: Phone connected directly to PC with USB cable.
Normal battery current consumption can not be observed.
Phone does not start up or is jammed
Abnormal current Consumption (Less than approx. 20 mA or over 500 mA)
Dead or jammed device troubleshooting
Nothing happens When power key is pressed
Power key troubleshooting
Normal current consumption (Between approx. 20 and 500 mA)
Something happens but phone does not wake up
Go to General power checking - APE troubleshooting
No phoenix connection to the phone
Attempt Phoenix connection
Flash the phone with FPS box
Flashing fails
Go to Flash programming fault troubleshooting
All OK
Go to General power checking - CMT troubleshooting
Phoenix connection works
Flashing succeeded
Run all selftests in 'Test' mode
ST_PWR_KEY_TEST failures
ST_PWR_KEY_TEST failures
All OK
Battery current measuring fault troubleshooting
No fail or ST_PWR_KEY_TEST failure
Power consumption normal, no selftest failures
Something else than ST_PWR_KEY_TEST fails
Display does not work
Yes
ST_MAIN_LCD_IF_TEST fails
Display Module troubleshooting
No
One or several of the following fails: ST_CURRENT_CONS_TEST ST_KEYBOARD_STUCK_TEST ST_BACKUP_BATT_TEST ST_RADIO_TEST ST_WLAN_TEST
Yes
Go to the respective troubleshooting:
- General Power Checking Troubleshooting
- Keypad troubleshooting
- General Power Checking (Check VBACK)
- FM radio troubleshooting
- WLAN troubleshooting
No
ST_CAMERA_IF_TEST failure
Yes
Go to main camera troubleshooting
No
ST_CAMERA_AUTOFOCUS_TEST failure
Yes
Replace main camera
No
ST_SEC_CAMERA_IF_TEST failure
Yes
Go to secondary (front) camera troubleshooting
No
ST_SIM_CLK_LOOP_TEST ST_SIM_IO_CTRL_LOOP_TEST
Not OK
Go to SIM card troubleshooting
OK
Continue to next page

Figure 14 Phoenix self test troubleshooting part 1

Copyright © 2008 Nokia. All rights reserved.

Troubleshooting flow

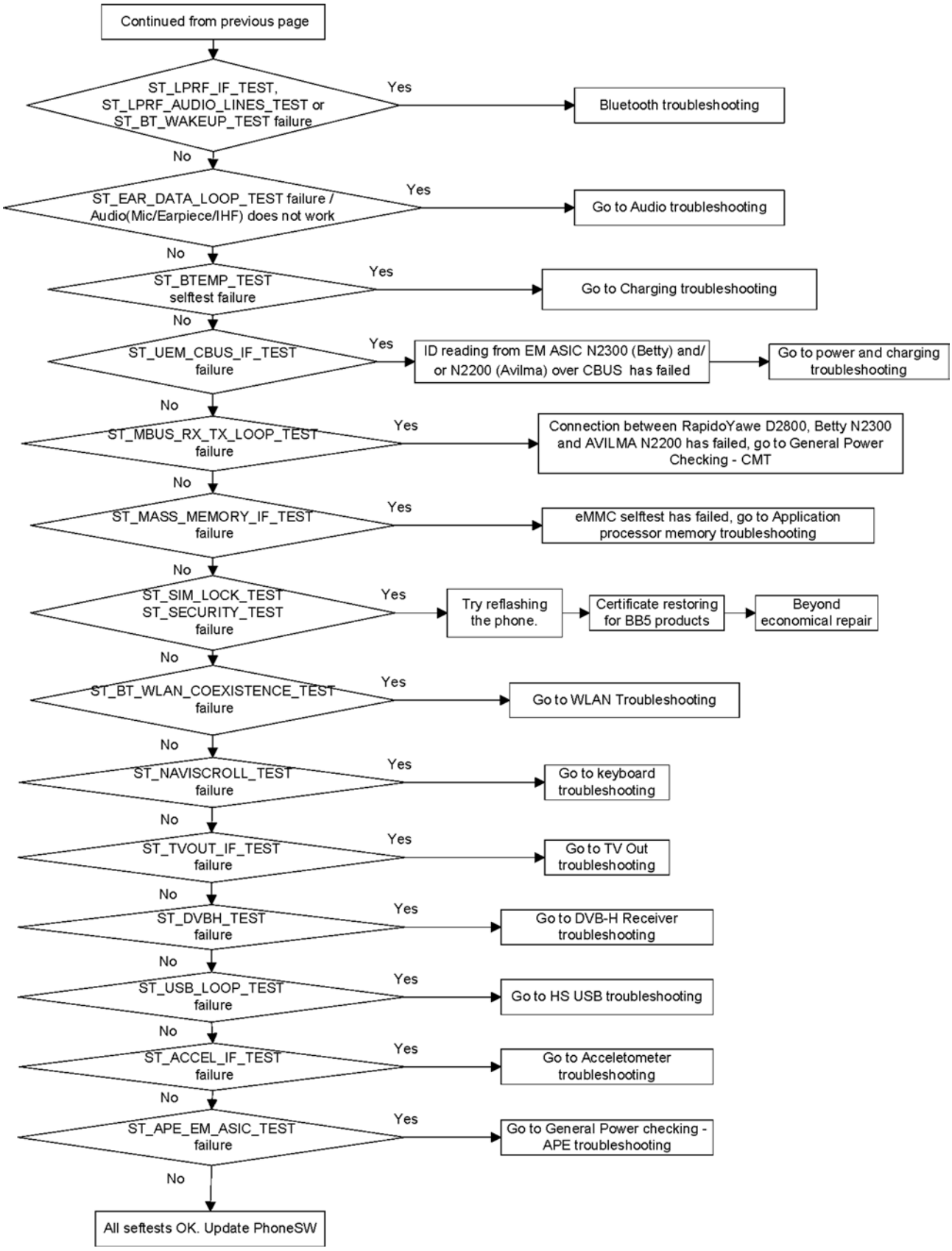
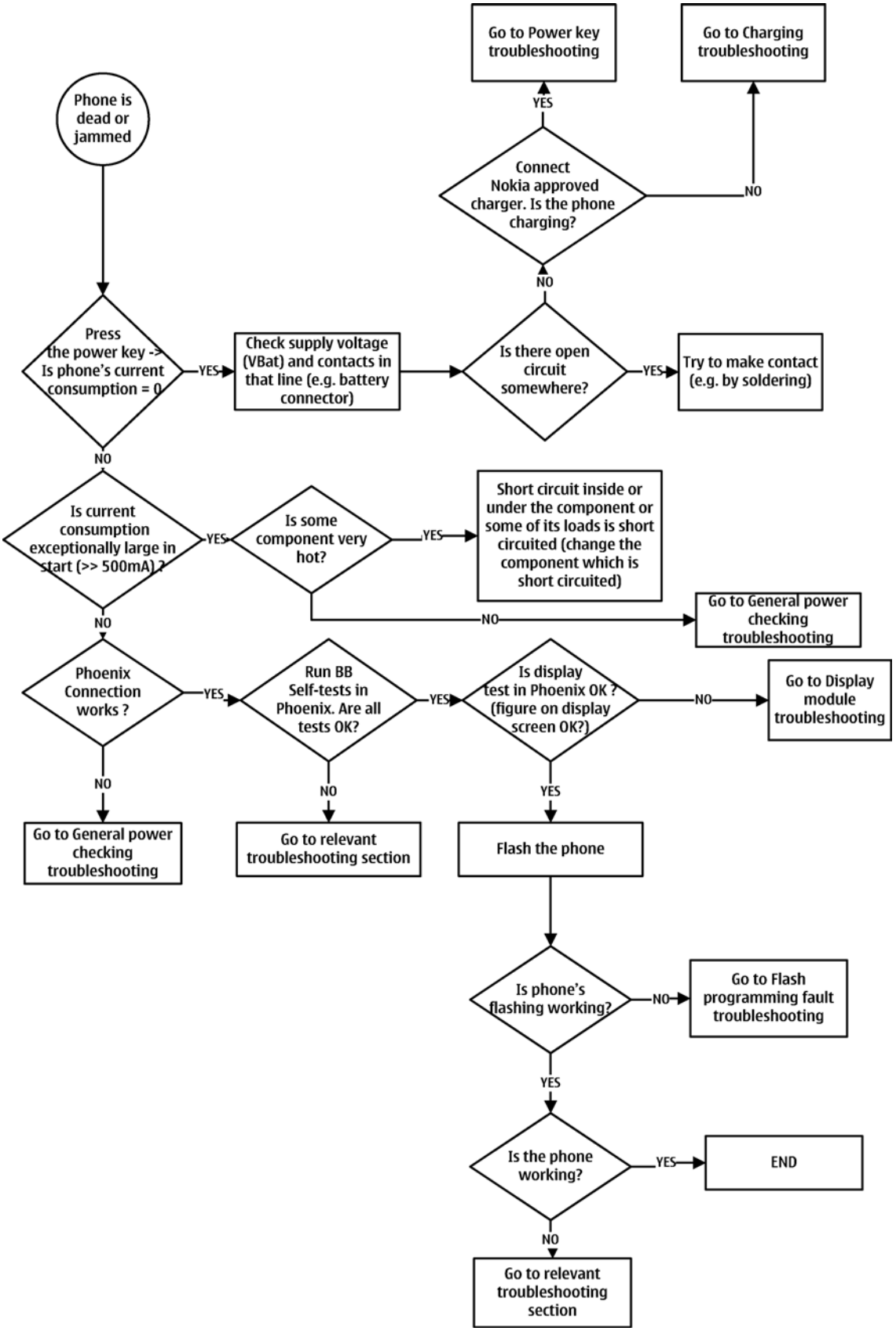


Figure 15 Phoenix self test troubleshooting part 2

Copyright © 2008 Nokia. All rights reserved.

Dead or jammed device troubleshooting

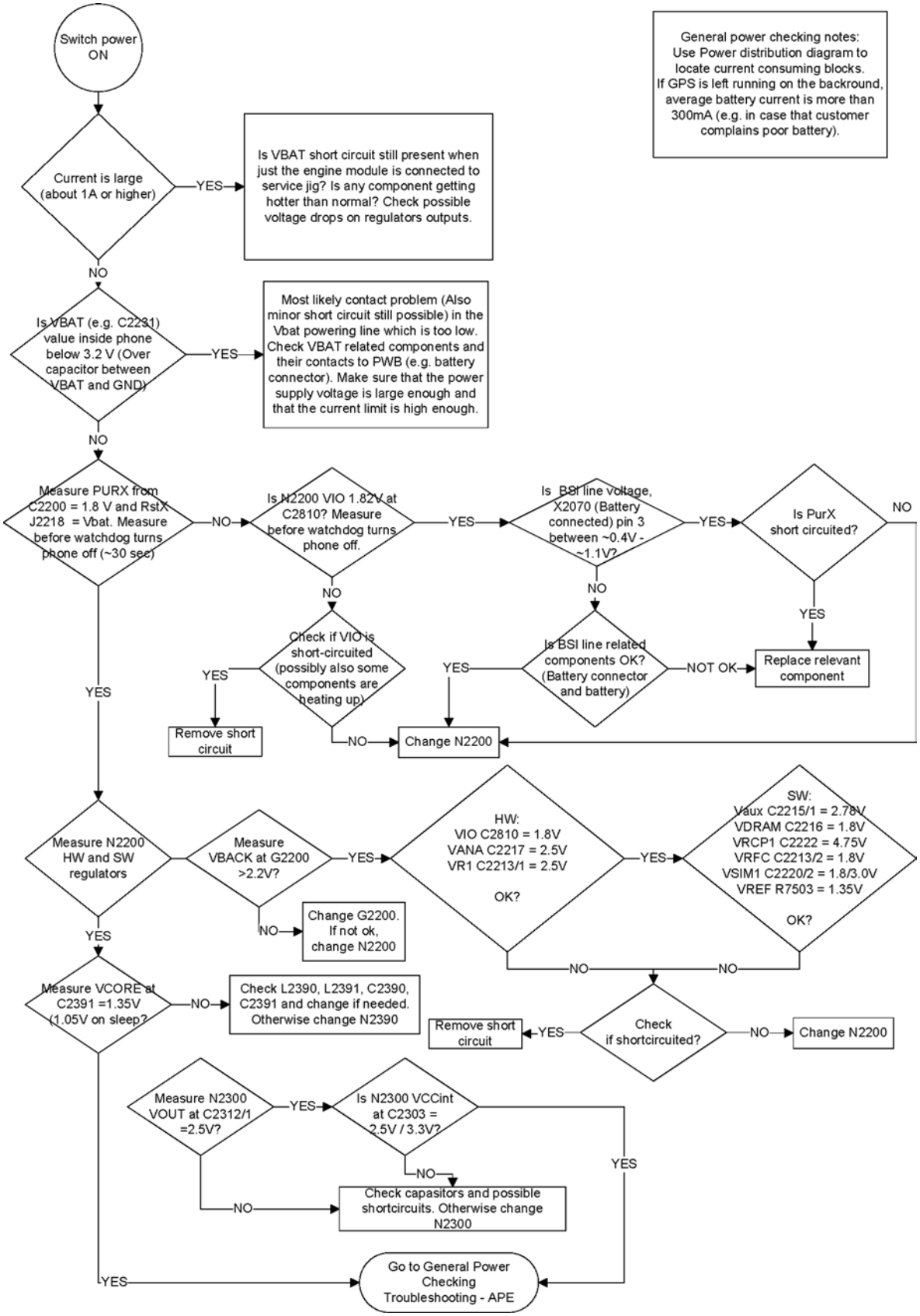
Troubleshooting flow


Phone is dead or jammed
Press the power key -> Is phone's current consumption = 0
YES
Check supply voltage (VBat) and contacts in that line (e.g. battery connector)
Is there open circuit somewhere?
YES
Try to make contact (e.g. by soldering)
NO
Connect Nokia approved charger. Is the phone charging?
YES
Go to Power key troubleshooting
NO
Go to Charging troubleshooting
NO
Is current consumption exceptionally large in start (>> 500mA) ?
YES
Is some component very hot?
YES
Short circuit inside or under the component or some of its loads is short circuited (change the component which is short circuited)
NO
Go to General power checking troubleshooting
NO
Phoenix Connection works ?
YES
Run BB Self-tests in Phoenix. Are all tests OK?
YES
Is display test in Phoenix OK ? (figure on display screen OK?)
NO
Go to Display module troubleshooting
NO
Go to General power checking troubleshooting
NO
Go to relevant troubleshooting section
YES
Flash the phone
Is phone's flashing working?
NO
Go to Flash programming fault troubleshooting
YES
Is the phone working?
YES
END
NO
Go to relevant troubleshooting section

Copyright © 2008 Nokia. All rights reserved.

General power checking troubleshooting - CMT

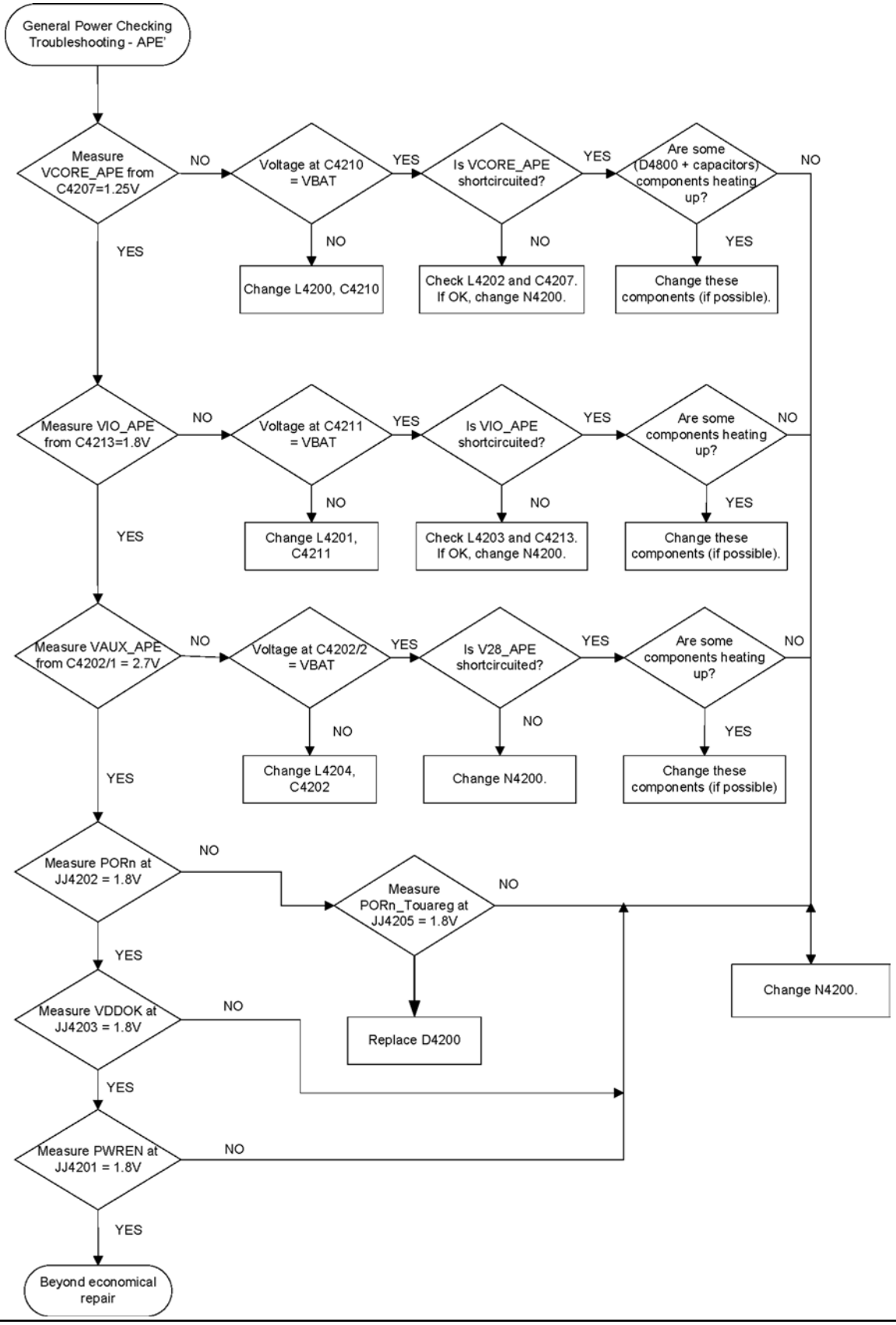
Troubleshooting flow


Switch power ON
General power checking notes: Use Power distribution diagram to locate current consuming blocks. If GPS is left running on the backround, average battery current is more than 300mA (e.g. in case that customer complains poor battery).
Current is large (about 1A or higher)
YES
Is VBAT short circuit still present when just the engine module is connected to service jig? Is any component getting hotter than normal? Check possible voltage drops on regulators outputs.
NO
Is VBAT (e.g. C2231) value inside phone below 3.2 V (Over capacitor between VBAT and GND)
YES
Most likely contact problem (Also minor short circuit still possible) in the Vbat powering line which is too low. Check VBAT related components and their contacts to PWB (e.g. battery connector). Make sure that the power supply voltage is large enough and that the current limit is high enough.
NO
Measure PURX from C2200 = 1.8 V and RstX J2218 = Vbat. Measure before watchdog turns phone off (~30 sec)
NO
Is N2200 VIO 1.82V at C2810? Measure before watchdog turns phone off.
YES
Is BSI line voltage, X2070 (Battery connected) pin 3 between ~0.4V - ~1.1V?
YES
Is PurX short circuited?
NO
YES
Replace relevant component
NO
Is BSI line related components OK? (Battery connector and battery)
NOT OK
YES
NO
Check if VIO is short-circuited (possibly also some components are heating up)
YES
Remove short circuit
NO
Change N2200
YES
Measure N2200 HW and SW regulators
Measure VBACK at G2200 >2.2V?
YES
NO
Change G2200. If not ok, change N2200
HW: VIO C2810 = 1.8V VANA C2217 = 2.5V VR1 C2213/1 = 2.5V OK?
YES
SW: Vaux C2215/1 = 2.78V VDRAM C2216 = 1.8V VRCP1 C2222 = 4.75V VRFC C2213/2 = 1.8V VSIM1 C2220/2 = 1.8/3.0V VREF R7503 = 1.35V OK?
NO
NO
YES
Measure VCORE at C2391 =1.35V (1.05V on sleep?
NO
Check L2390, L2391, C2390, C2391 and change if needed. Otherwise change N2390
Remove short circuit
YES
Check if shortcircuited?
NO
Change N2200
Measure N2300 VOUT at C2312/1 =2.5V?
YES
Is N2300 VCCint at C2303 = 2.5V / 3.3V?
YES
NO
NO
Check capasitors and possible shortcircuits. Otherwise change N2300
YES
Go to General Power Checking Troubleshooting - APE

Copyright © 2008 Nokia. All rights reserved.

General power checking troubleshooting - APE

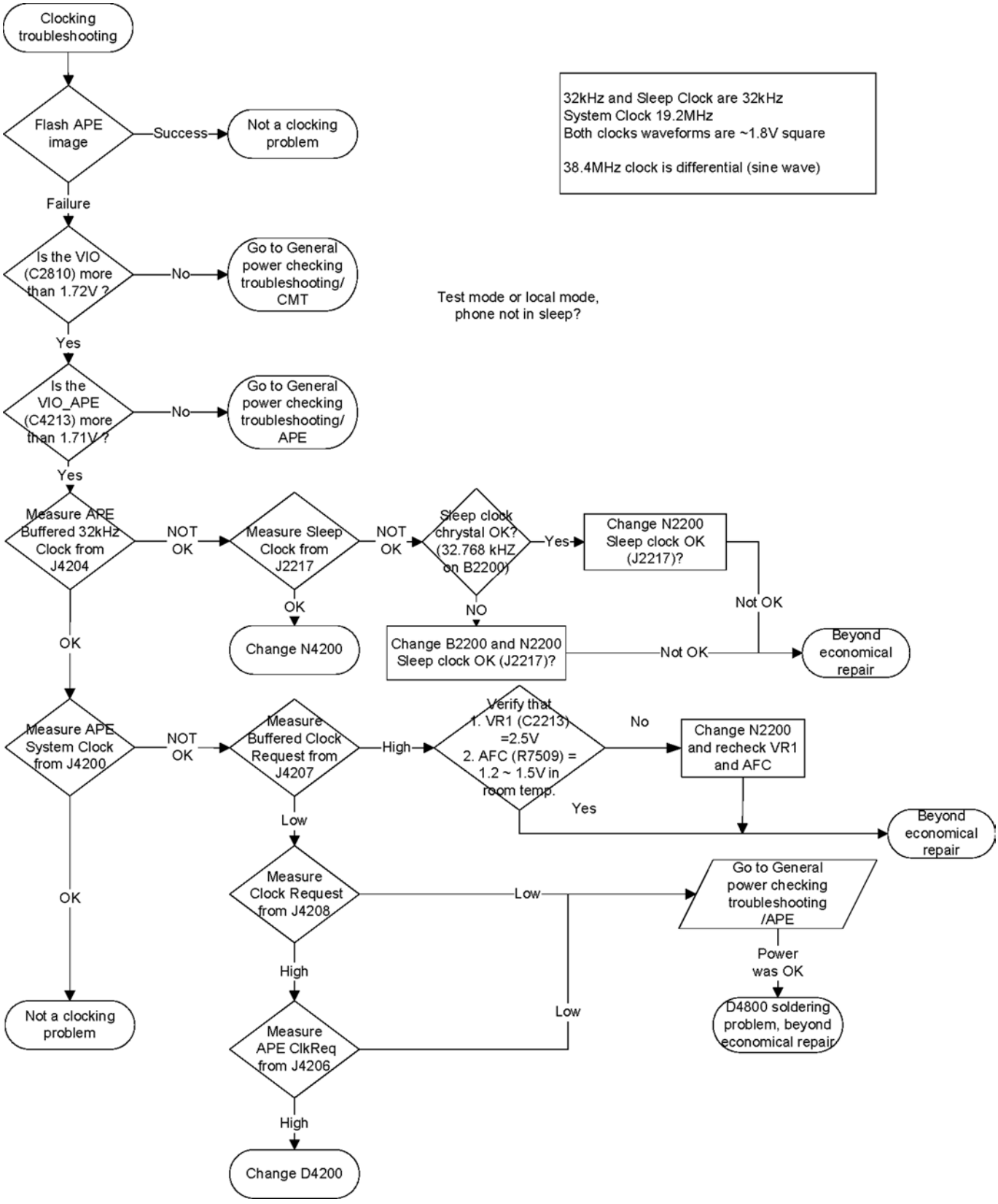
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Clocking troubleshooting

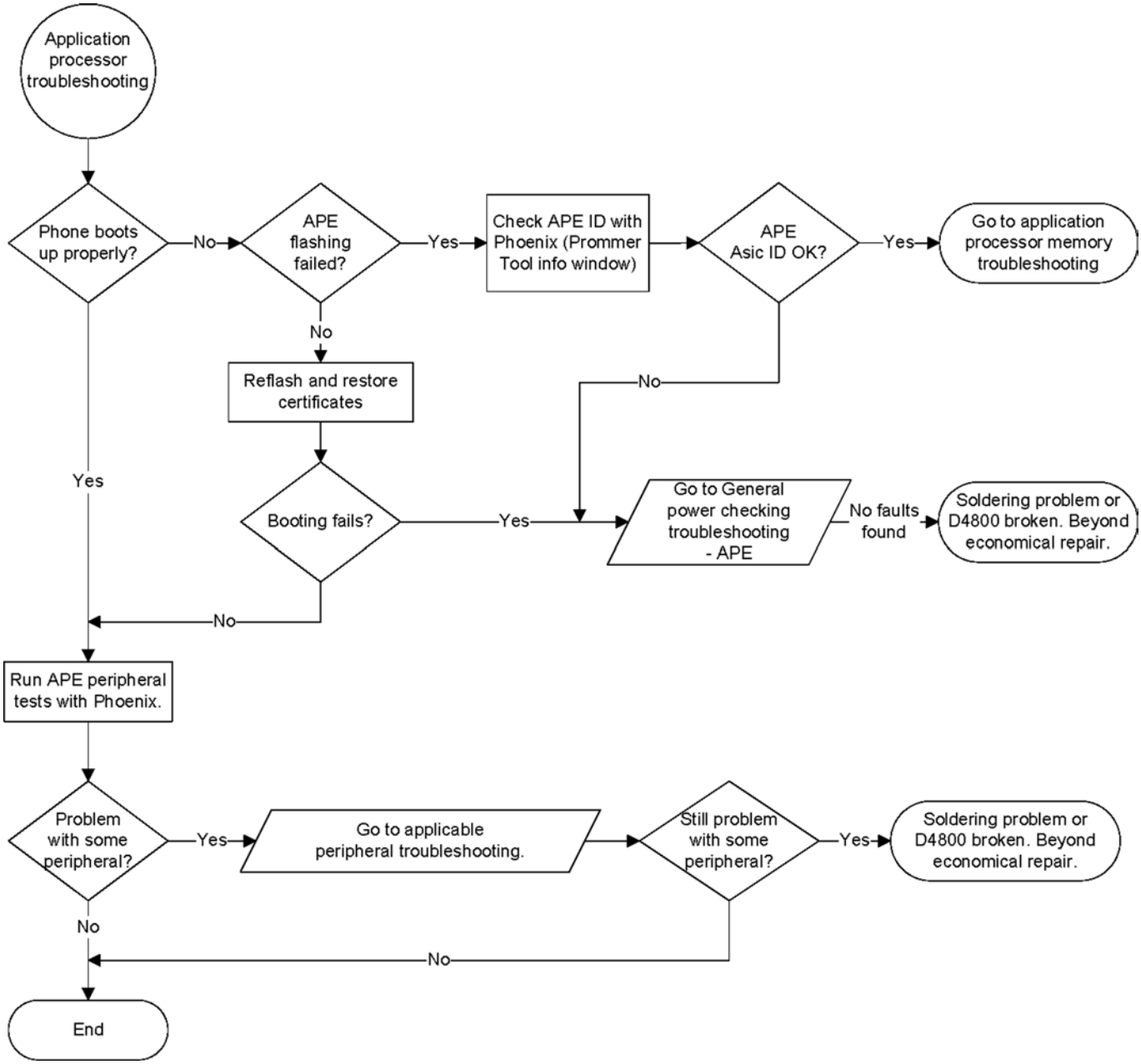
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Application processor troubleshooting

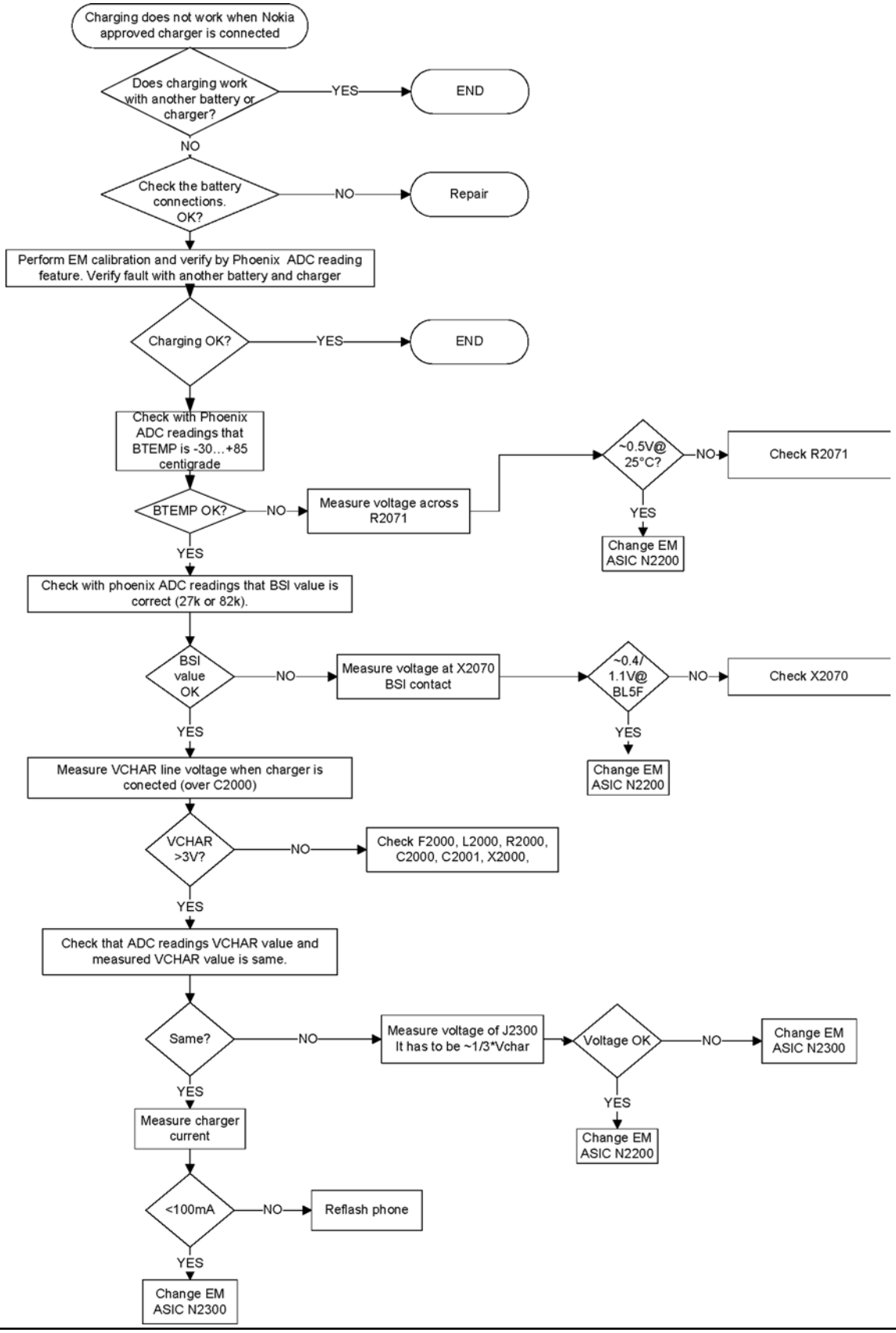
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Charging troubleshooting

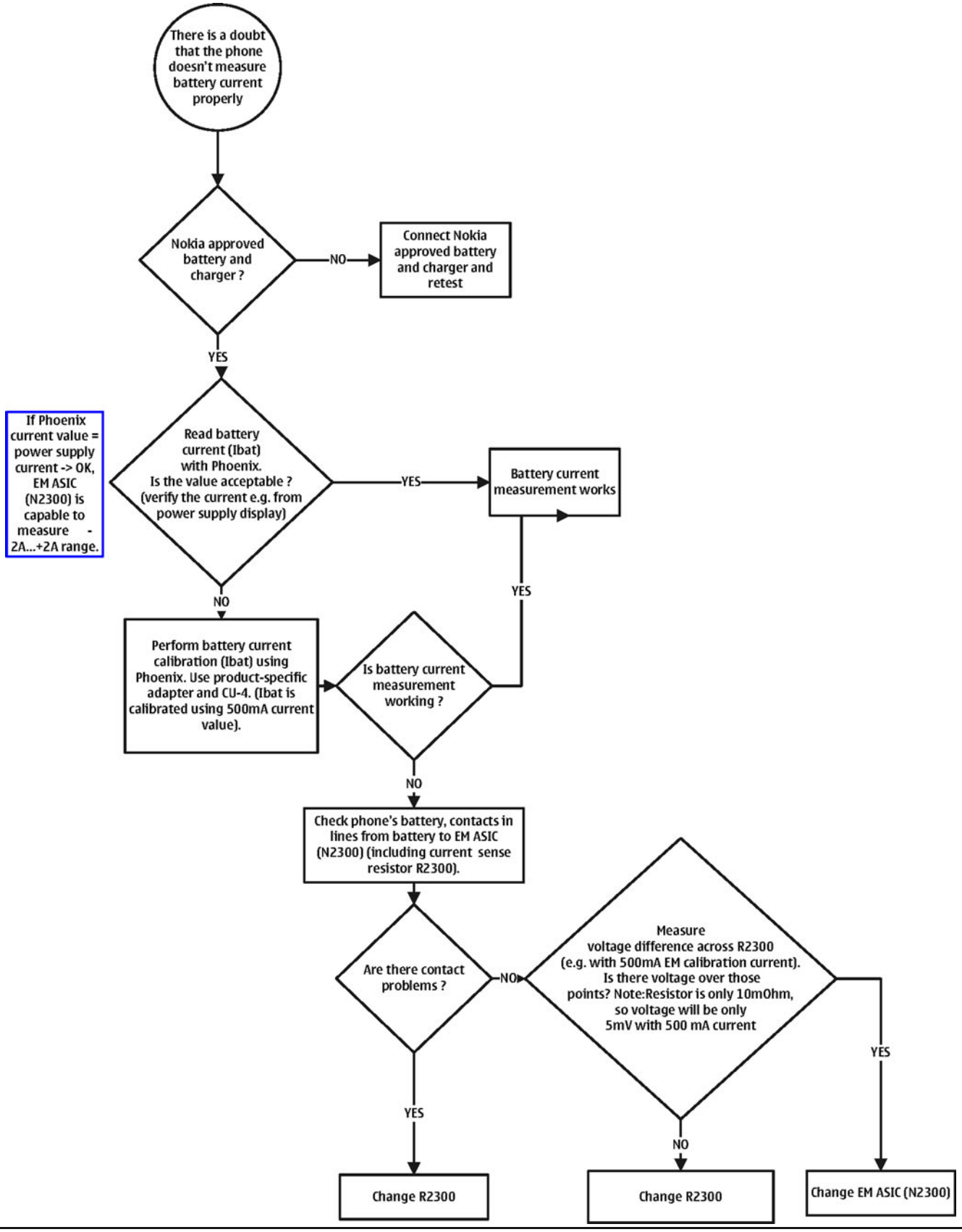
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Battery current measuring fault troubleshooting

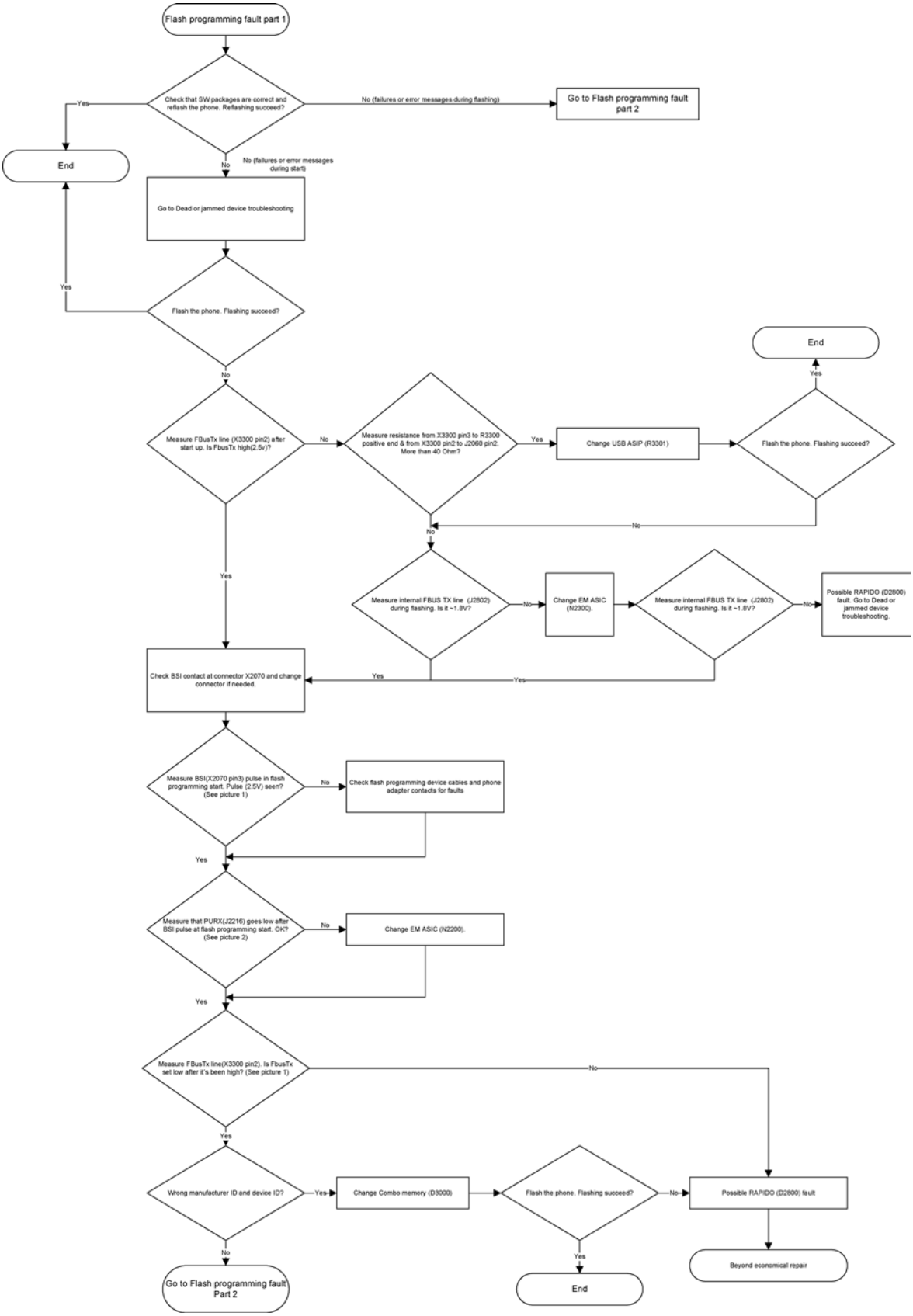
Troubleshooting flow


There is a doubt that the phone doesn't measure battery current properly
Nokia approved battery and charger ?
NO
Connect Nokia approved battery and charger and retest
YES
If Phoenix current value = power supply current -> OK, EM ASIC (N2300) is capable to measure -2A...+2A range.
Read battery current (Ibat) with Phoenix. Is the value acceptable ? (verify the current e.g. from power supply display)
YES
Battery current measurement works
NO
YES
Perform battery current calibration (Ibat) using Phoenix. Use product-specific adapter and CU-4. (Ibat is calibrated using 500mA current value).
Is battery current measurement working ?
NO
Check phone's battery, contacts in lines from battery to EM ASIC (N2300) (including current sense resistor R2300).
Are there contact problems ?
NO
Measure voltage difference across R2300 (e.g. with 500mA EM calibration current). Is there voltage over those points? Note:Resistor is only 10mOhm, so voltage will be only 5mV with 500 mA current
YES
YES
NO
Change R2300
Change R2300
Change EM ASIC (N2300)

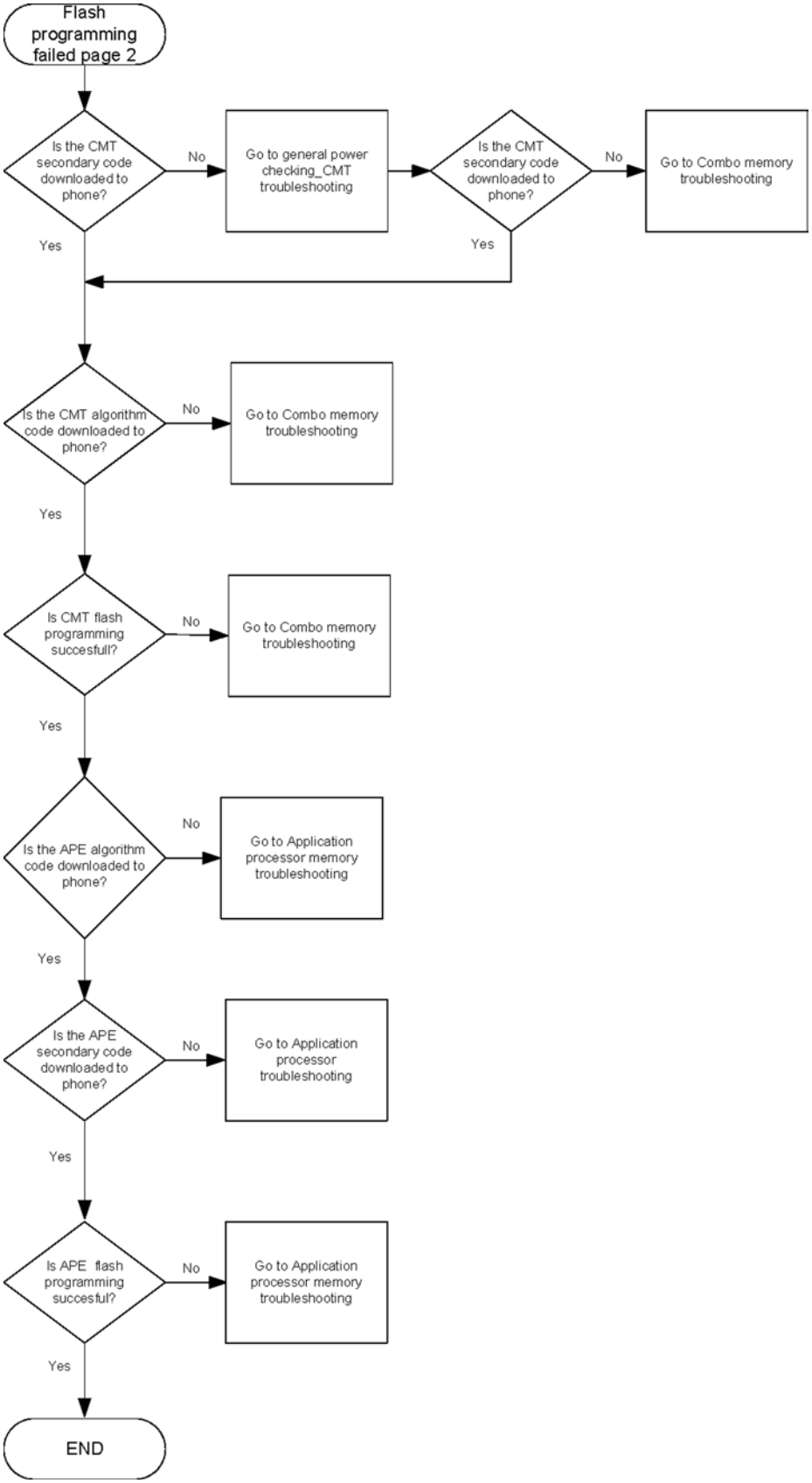
Copyright © 2008 Nokia. All rights reserved.

Flash programming fault troubleshooting

Troubleshooting flow


Flash programming fault part 1
Check that SW packages are correct and reflash the phone. Reflashing succeed?
Yes
No (failures or error messages during flashing)
Go to Flash programming fault part 2
End
No
No (failures or error messages during start)
Go to Dead or jammed device troubleshooting
Yes
Flash the phone. Flashing succeed?
No
End
Yes
Measure FBusTx line (X3300 pin2) after start up. Is FbusTx high(2.5v)?
No
Measure resistance from X3300 pin3 to R3300 positive end & from X3300 pin2 to J2060 pin2. More than 40 Ohm?
Yes
Change USB ASIP (R3301)
Flash the phone. Flashing succeed?
Yes
No
No
Measure internal FBUS TX line (J2802) during flashing. Is it ~1.8V?
No
Change EM ASIC (N2300).
Measure internal FBUS TX line (J2802) during flashing. Is it ~1.8V?
No
Possible RAPIDO (D2800) fault. Go to Dead or jammed device troubleshooting.
Yes
Check BSI contact at connector X2070 and change connector if needed.
Yes
Yes
Measure BSI(X2070 pin3) pulse in flash programming start. Pulse (2.5V) seen? (See picture 1)
No
Check flash programming device cables and phone adapter contacts for faults
Yes
Measure that PURX(J2216) goes low after BSI pulse at flash programming start. OK? (See picture 2)
No
Change EM ASIC (N2200).
Yes
Measure FBusTx line(X3300 pin2). Is FbusTx set low after it's been high? (See picture 1)
No
Yes
Wrong manufacturer ID and device ID?
Yes
Change Combo memory (D3000)
Flash the phone. Flashing succeed?
No
Possible RAPIDO (D2800) fault
No
Go to Flash programming fault Part 2
Yes
End
Beyond economical repair

Copyright © 2008 Nokia. All rights reserved.



Copyright © 2008 Nokia. All rights reserved.

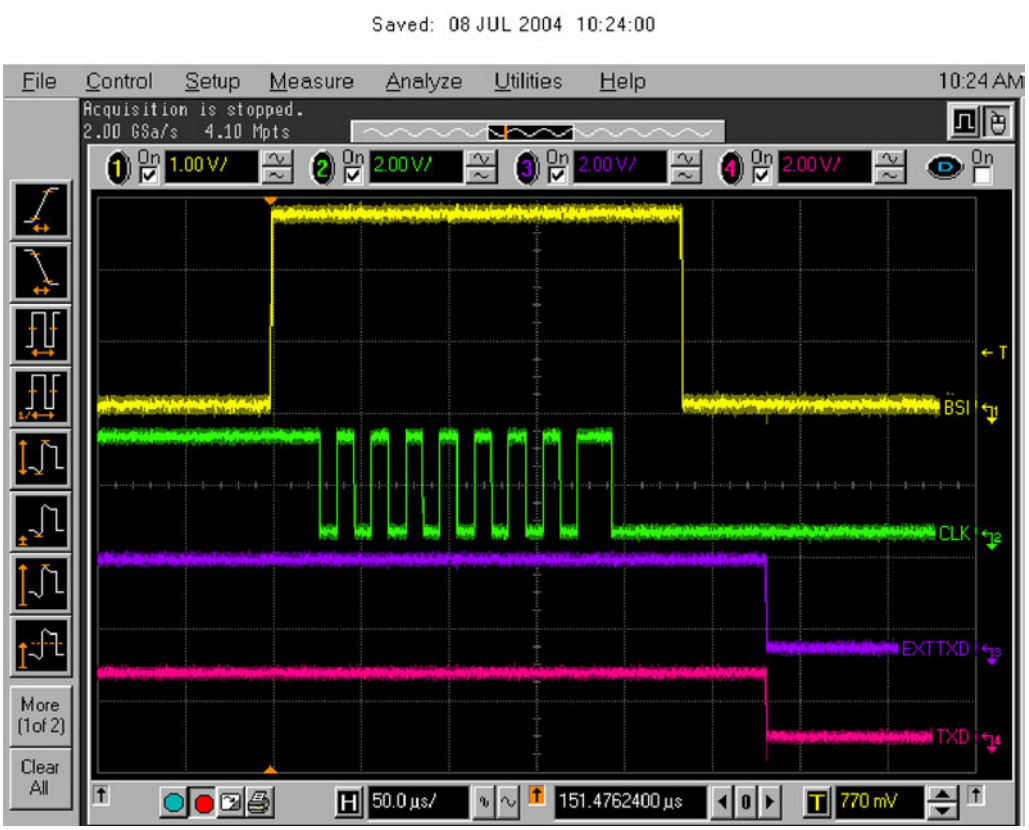


Figure 16 Flashing pic 1. Take single triggered measurement for the rise of the BSI signal

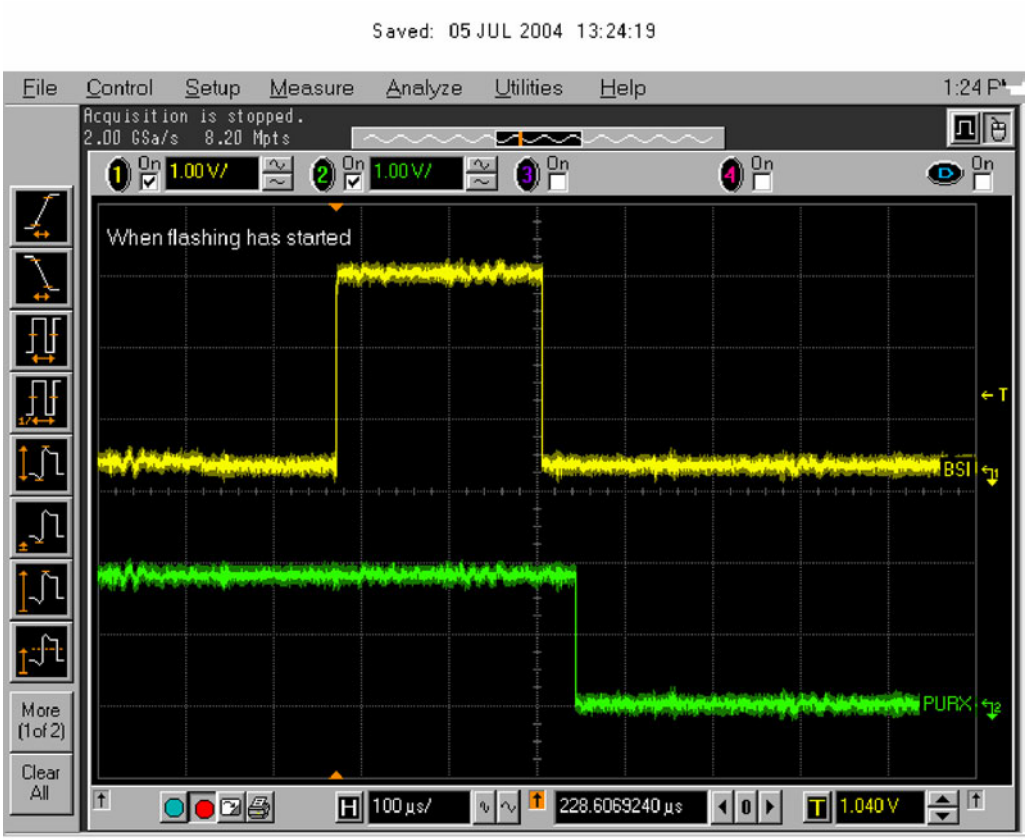
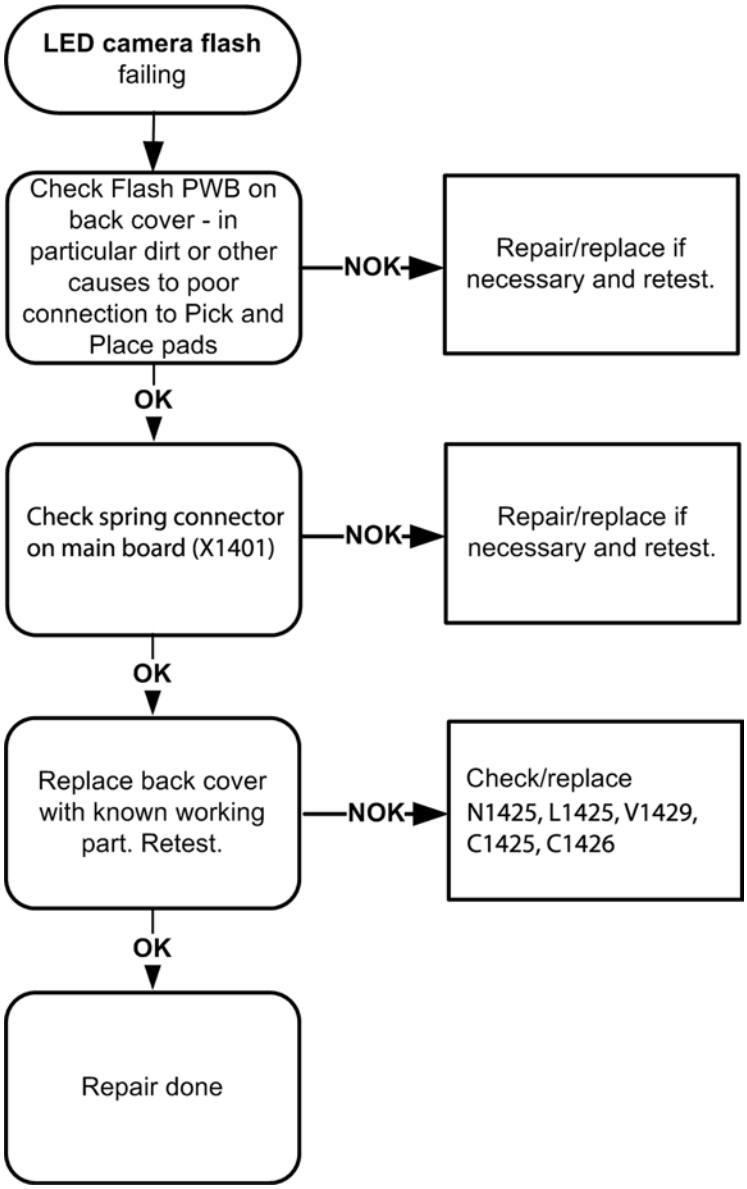


Figure 17 Flashing pic 2. Take single triggered measurement for the rise of the BSI signal

Copyright © 2008 Nokia. All rights reserved.

LED camera flash troubleshooting

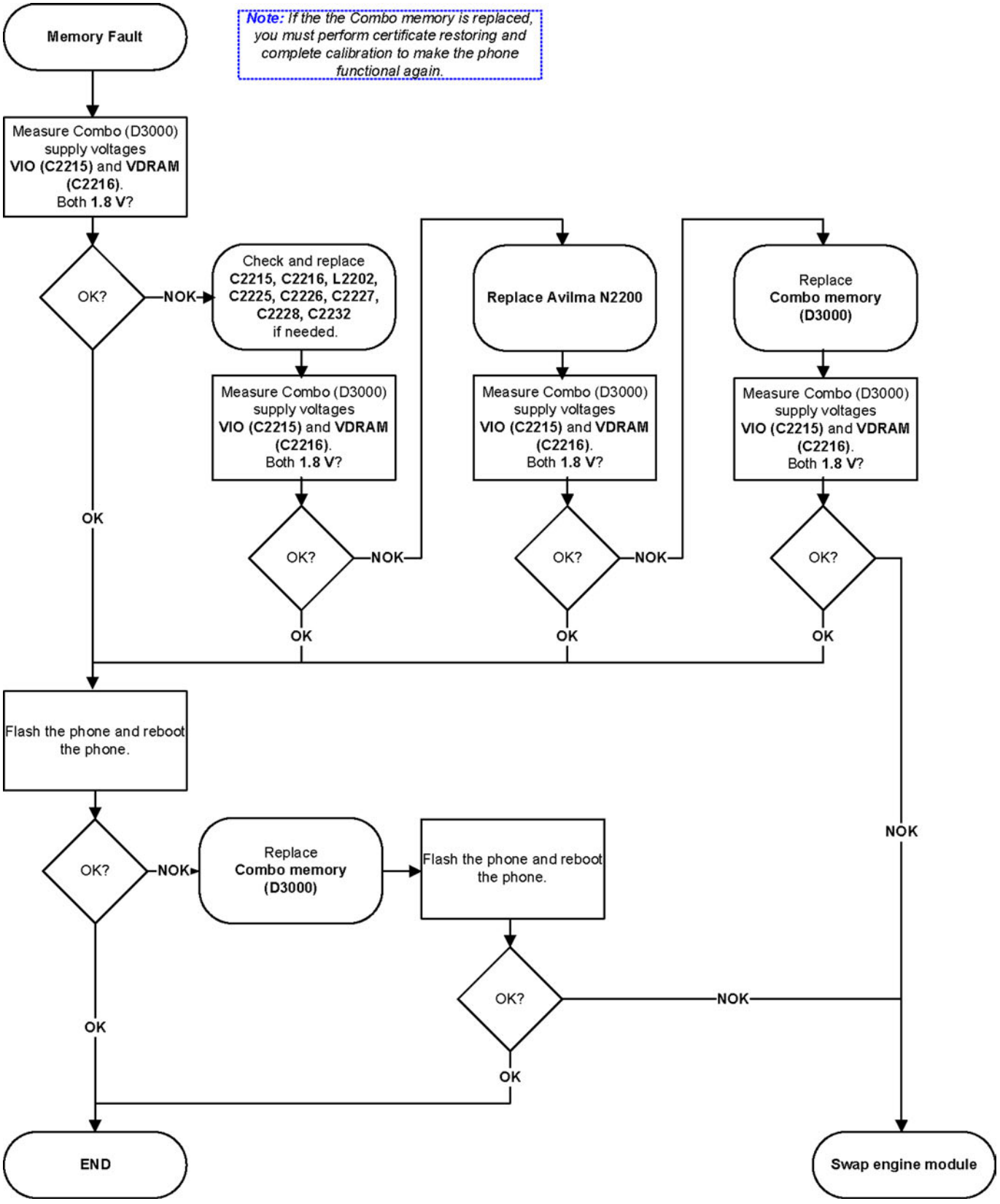
Troubleshooting flow


LED camera flash failing
Check Flash PWB on back cover - in particular dirt or other causes to poor connection to Pick and Place pads
NOK
Repair/replace if necessary and retest.
OK
Check spring connector on main board (X1401)
NOK
Repair/replace if necessary and retest.
OK
Replace back cover with known working part. Retest.
NOK
Check/replace N1425, L1425, V1429, C1425, C1426
OK
Repair done

Copyright © 2008 Nokia. All rights reserved.

CMT combo memory fault troubleshooting

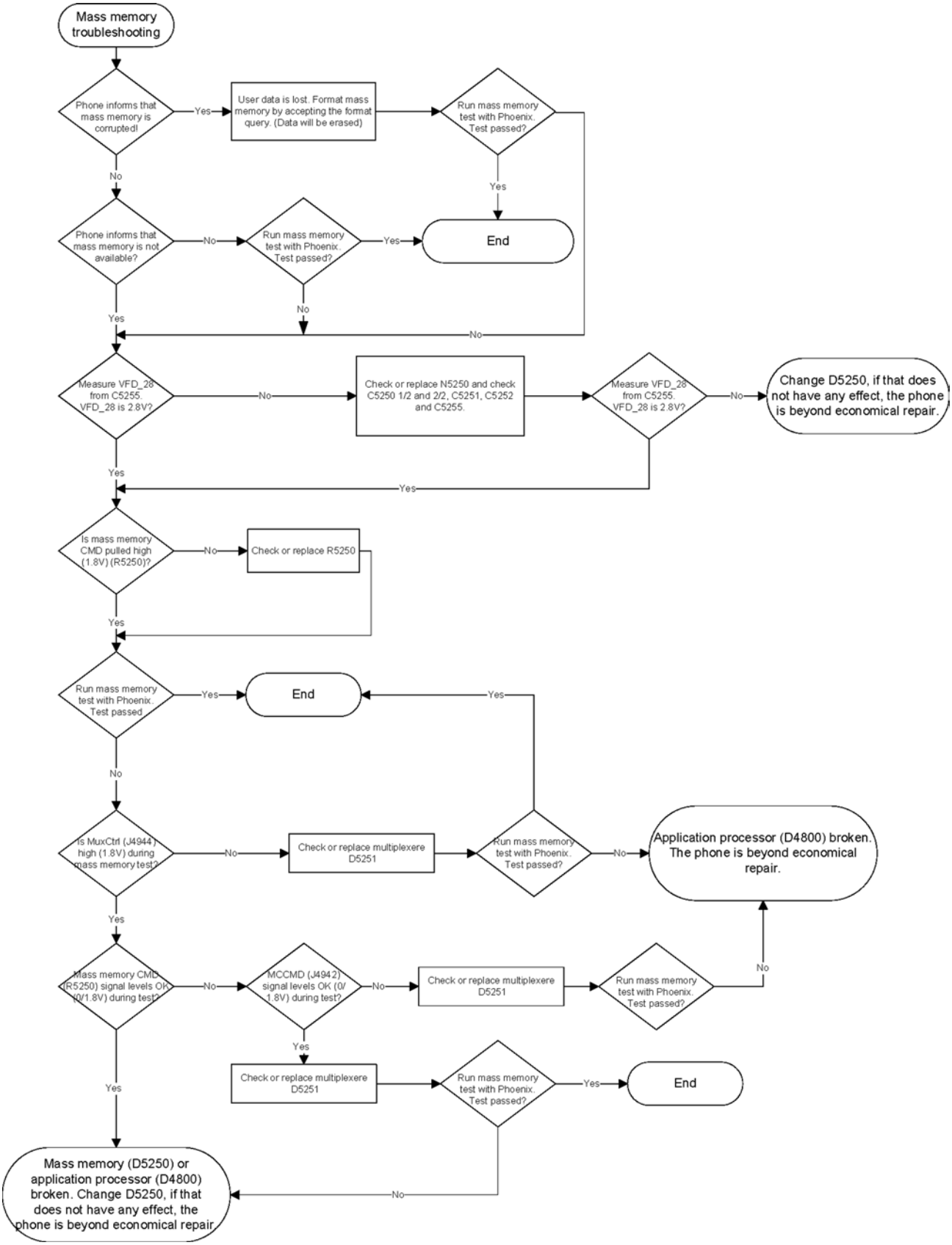
Troubleshooting flow


Memory Fault
Note: If the the Combo memory is replaced, you must perform certificate restoring and complete calibration to make the phone functional again.
Measure Combo (D3000) supply voltages VIO (C2215) and VDRAM (C2216). Both 1.8 V?
OK?
NOK
OK
Check and replace C2215, C2216, L2202, C2225, C2226, C2227, C2228, C2232 if needed.
Measure Combo (D3000) supply voltages VIO (C2215) and VDRAM (C2216). Both 1.8 V?
OK?
NOK
OK
Replace Avilma N2200
Measure Combo (D3000) supply voltages VIO (C2215) and VDRAM (C2216). Both 1.8 V?
OK?
NOK
OK
Replace Combo memory (D3000)
Measure Combo (D3000) supply voltages VIO (C2215) and VDRAM (C2216). Both 1.8 V?
OK?
NOK
OK
Flash the phone and reboot the phone.
OK?
NOK
Replace Combo memory (D3000)
Flash the phone and reboot the phone.
OK?
NOK
OK
OK
END
NOK
Swap engine module

Copyright © 2008 Nokia. All rights reserved.

Mass memory troubleshooting

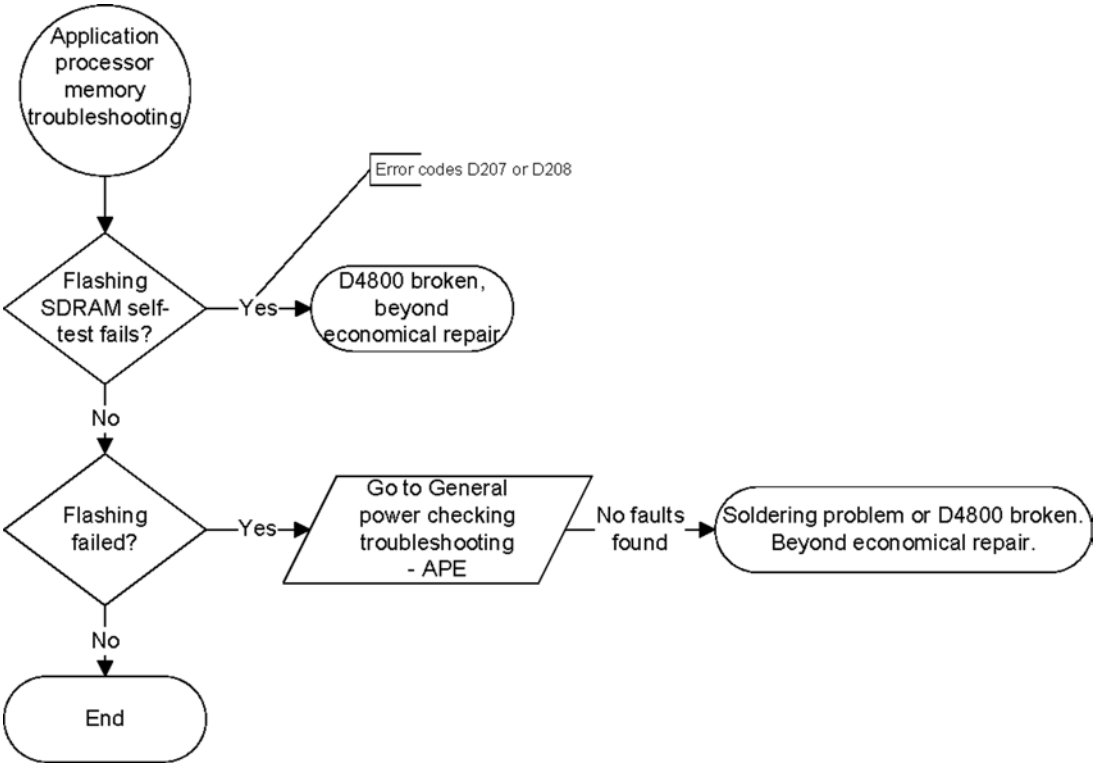
Troubleshooting flow


Mass memory troubleshooting
Phone informs that mass memory is corrupted!
Yes
User data is lost. Format mass memory by accepting the format query. (Data will be erased)
Run mass memory test with Phoenix. Test passed?
Yes
No
Phone informs that mass memory is not available?
No
Run mass memory test with Phoenix. Test passed?
Yes
End
No
Yes
No
Measure VFD_28 from C5255. VFD_28 is 2.8V?
No
Check or replace N5250 and check C5250 1/2 and 2/2, C5251, C5252 and C5255.
Measure VFD_28 from C5255. VFD_28 is 2.8V?
No
Change D5250, if that does not have any effect, the phone is beyond economical repair.
Yes
Yes
Is mass memory CMD pulled high (1.8V) (R5250)?
No
Check or replace R5250
Yes
Run mass memory test with Phoenix. Test passed
Yes
End
Yes
No
Is MuxCtrl (J4944) high (1.8V) during mass memory test?
No
Check or replace multiplexere D5251
Run mass memory test with Phoenix. Test passed?
No
Application processor (D4800) broken. The phone is beyond economical repair.
Yes
Mass memory CMD (R5250) signal levels OK (0/1.8V) during test?
No
MCCMD (J4942) signal levels OK (0/1.8V) during test?
No
Check or replace multiplexere D5251
Run mass memory test with Phoenix. Test passed?
No
Yes
Check or replace multiplexere D5251
Run mass memory test with Phoenix. Test passed?
Yes
End
Yes
Mass memory (D5250) or application processor (D4800) broken. Change D5250, if that does not have any effect, the phone is beyond economical repair
No

Copyright © 2008 Nokia. All rights reserved.

Application processor memory troubleshooting

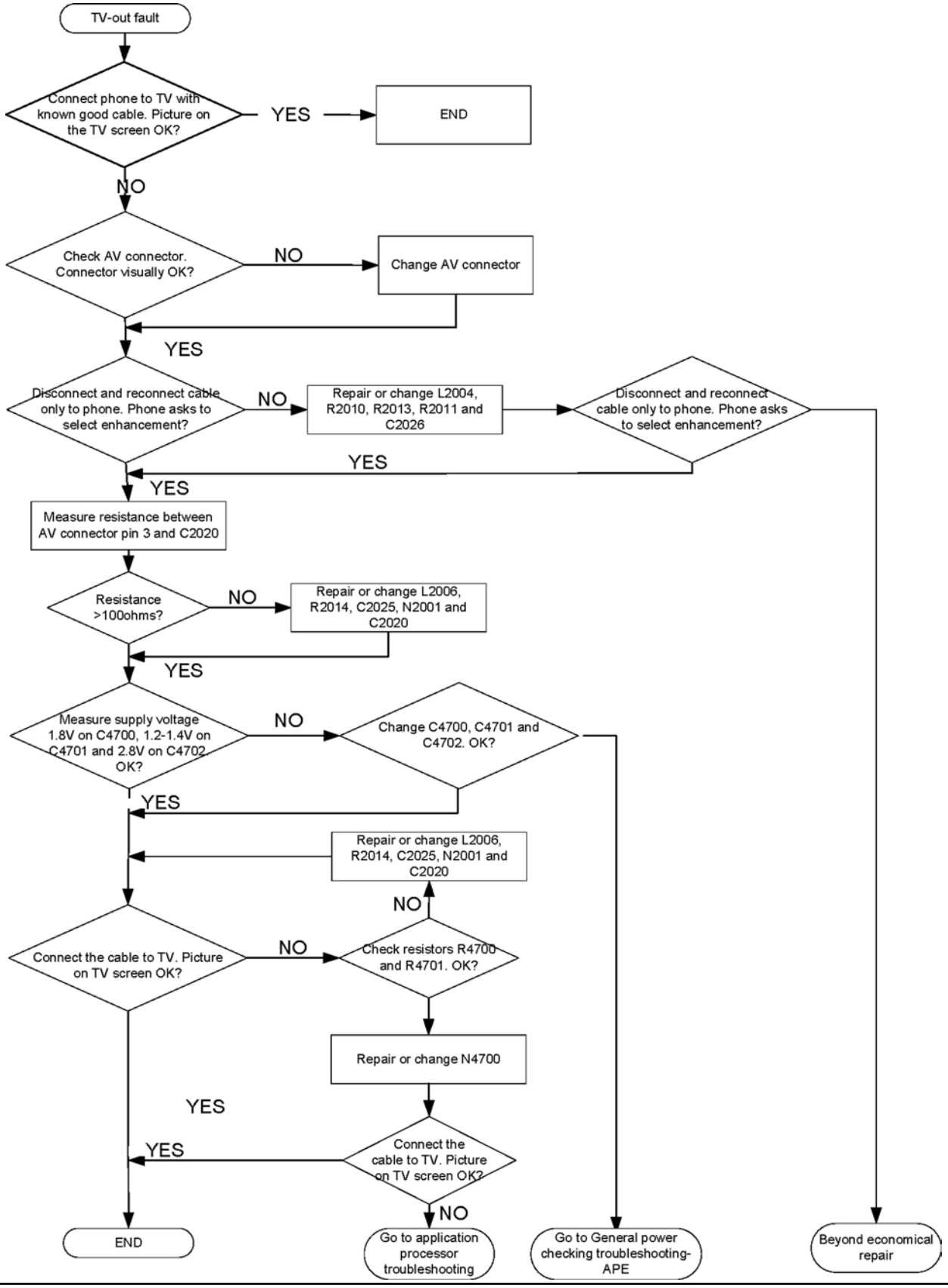
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

TV-out troubleshooting

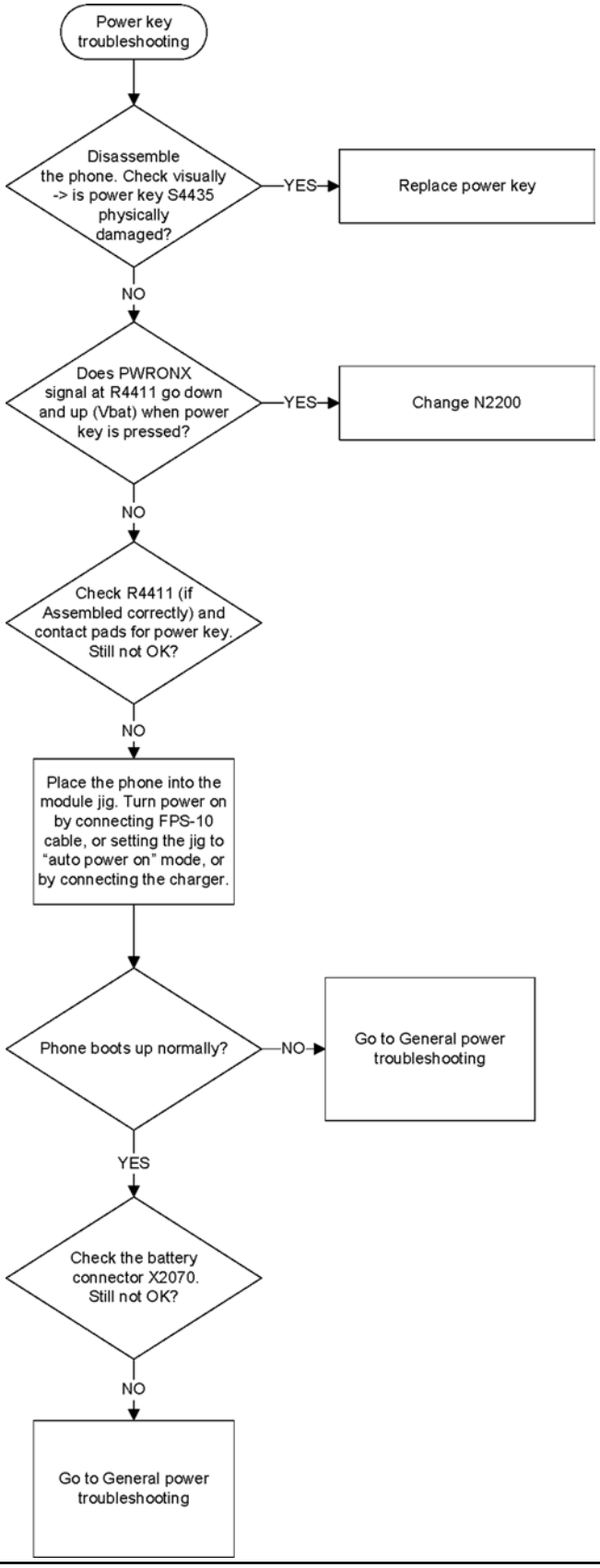
Troubleshooting flow


TV-out fault
Connect phone to TV with known good cable. Picture on the TV screen OK?
YES
END
NO
Check AV connector. Connector visually OK?
NO
Change AV connector
YES
Disconnect and reconnect cable only to phone. Phone asks to select enhancement?
NO
Repair or change L2004, R2010, R2013, R2011 and C2026
Disconnect and reconnect cable only to phone. Phone asks to select enhancement?
YES
YES
Measure resistance between AV connector pin 3 and C2020
Resistance >100ohms?
NO
Repair or change L2006, R2014, C2025, N2001 and C2020
YES
Measure supply voltage 1.8V on C4700, 1.2-1.4V on C4701 and 2.8V on C4702 OK?
NO
Change C4700, C4701 and C4702. OK?
YES
Repair or change L2006, R2014, C2025, N2001 and C2020
NO
Connect the cable to TV. Picture on TV screen OK?
NO
Check resistors R4700 and R4701. OK?
Repair or change N4700
YES
YES
Connect the cable to TV. Picture on TV screen OK?
NO
END
Go to application processor troubleshooting
Go to General power checking troubleshooting-APE
Beyond economical repair

Copyright © 2008 Nokia. All rights reserved.

Power key troubleshooting

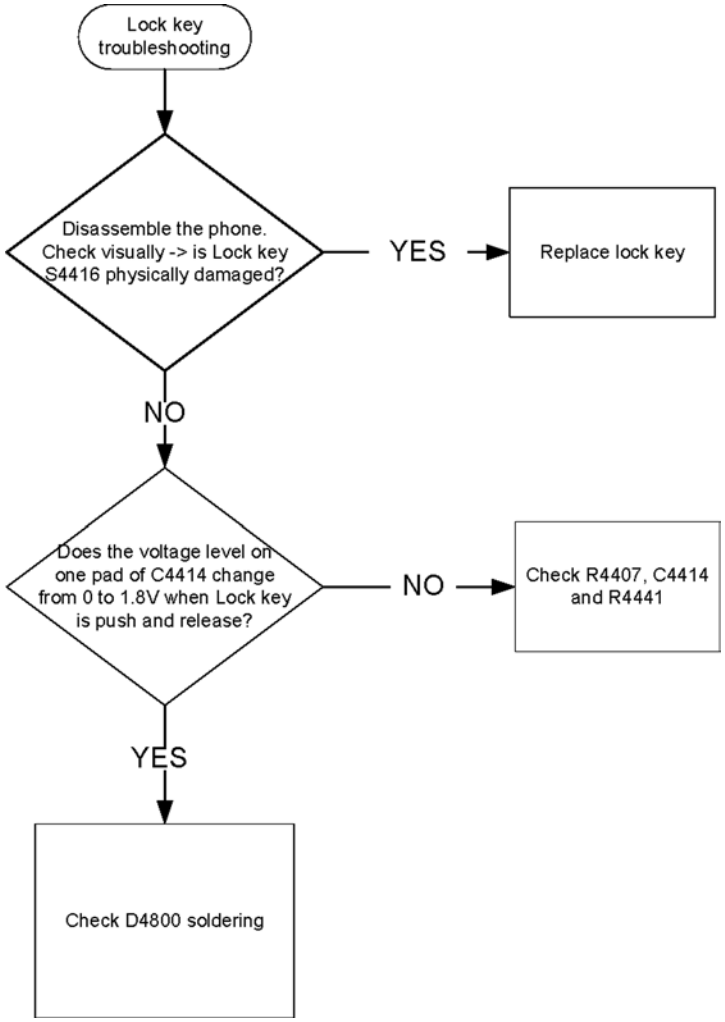
Troubleshooting flow


Power key troubleshooting
Disassemble the phone. Check visually -> is power key S4435 physically damaged?
YES
Replace power key
NO
Does PWRONX signal at R4411 go down and up (Vbat) when power key is pressed?
YES
Change N2200
NO
Check R4411 (if Assembled correctly) and contact pads for power key. Still not OK?
NO
Place the phone into the module jig. Turn power on by connecting FPS-10 cable, or setting the jig to "auto power on" mode, or by connecting the charger.
Phone boots up normally?
NO
Go to General power troubleshooting
YES
Check the battery connector X2070. Still not OK?
NO
Go to General power troubleshooting

Copyright © 2008 Nokia. All rights reserved.

Lock key troubleshooting

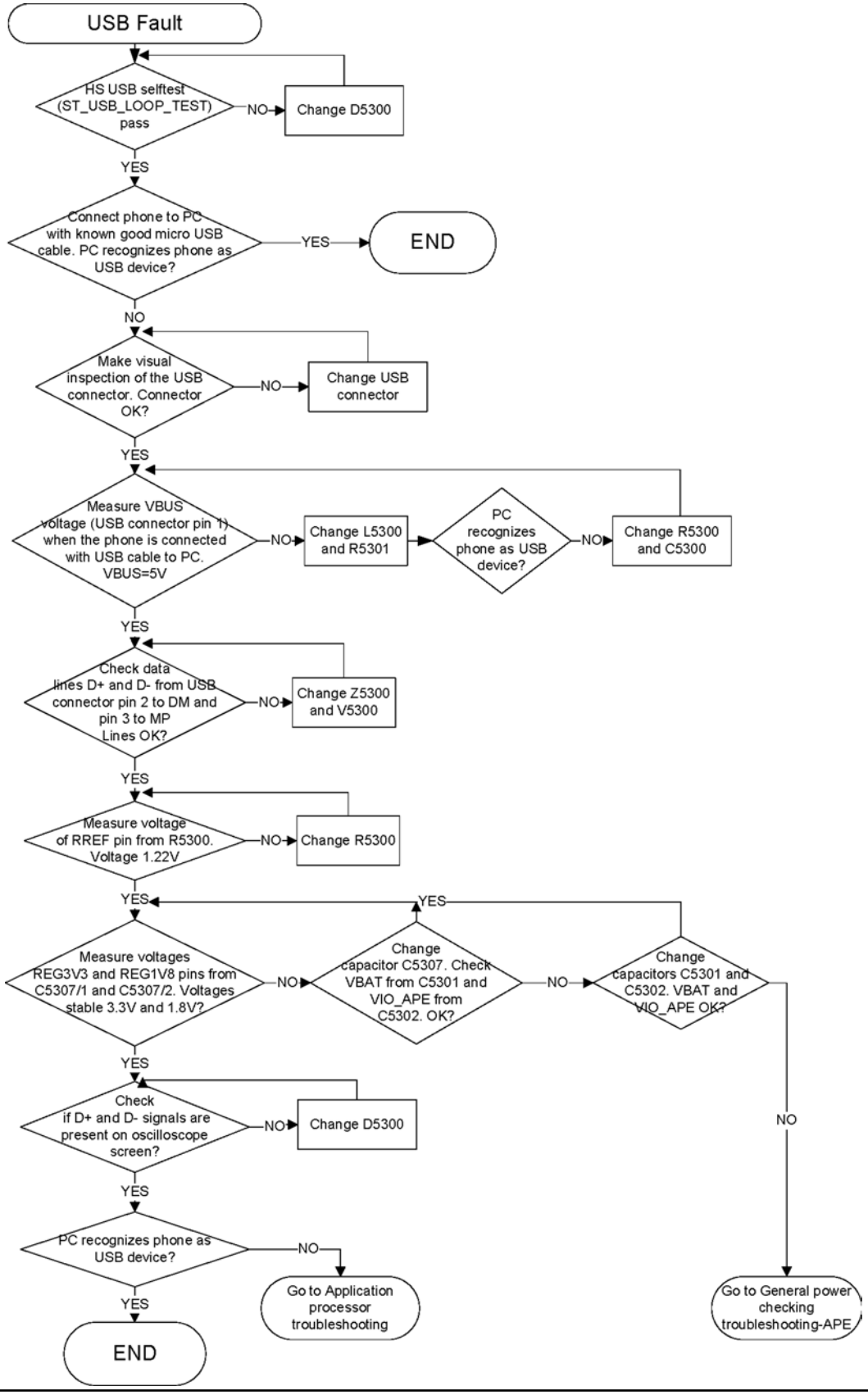
Troubleshooting flow


Lock key troubleshooting
Disassemble the phone. Check visually -> is Lock key S4416 physically damaged?
YES
Replace lock key
NO
Does the voltage level on one pad of C4414 change from 0 to 1.8V when Lock key is push and release?
NO
Check R4407, C4414 and R4441
YES
Check D4800 soldering

Copyright © 2008 Nokia. All rights reserved.

High-speed USB interface troubleshooting

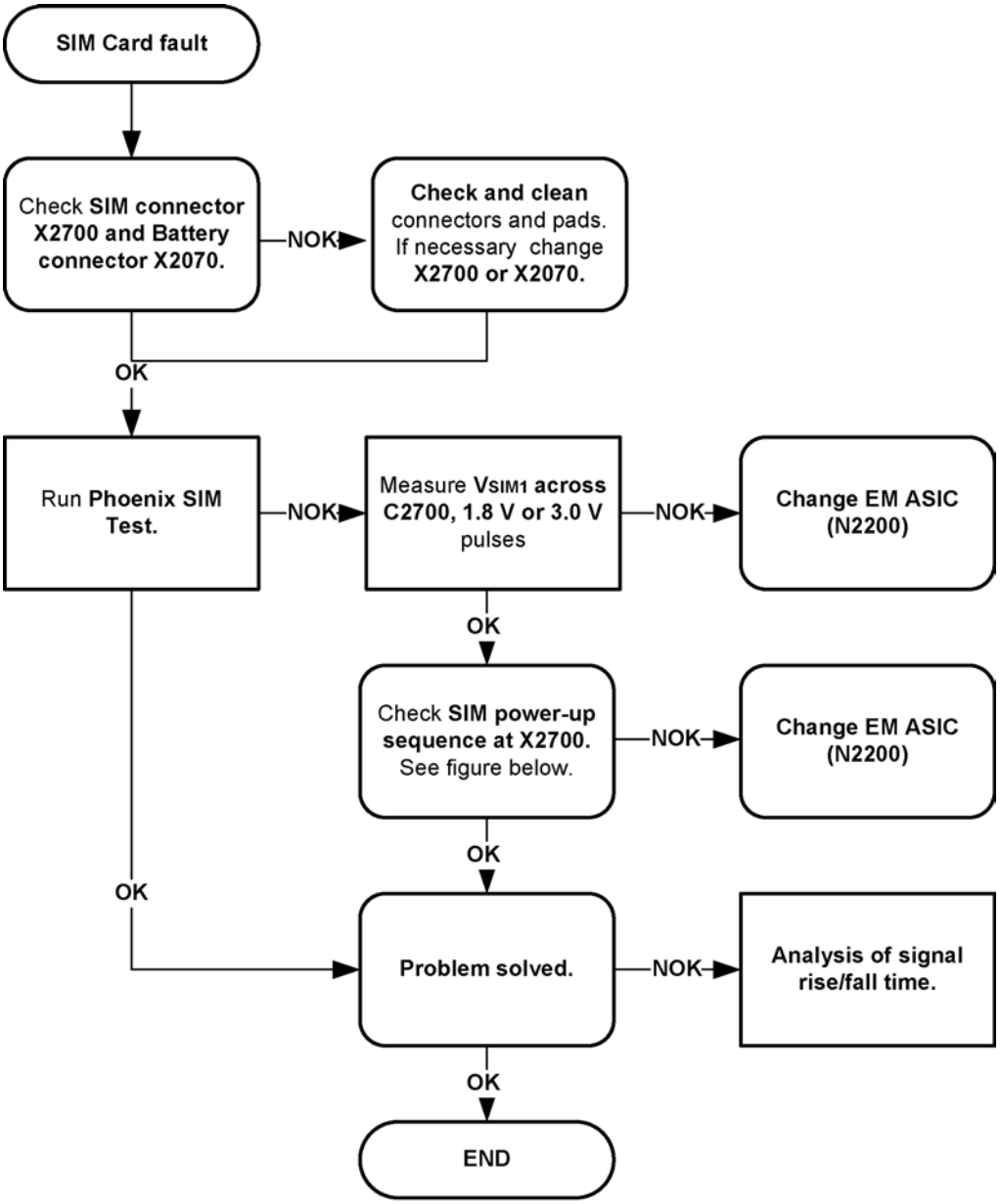
Troubleshooting flow


USB Fault
HS USB selftest (ST_USB_LOOP_TEST) pass
NO
Change D5300
YES
Connect phone to PC with known good micro USB cable. PC recognizes phone as USB device?
YES
END
NO
Make visual inspection of the USB connector. Connector OK?
NO
Change USB connector
YES
Measure VBUS voltage (USB connector pin 1) when the phone is connected with USB cable to PC. VBUS=5V
NO
Change L5300 and R5301
PC recognizes phone as USB device?
NO
Change R5300 and C5300
YES
Check data lines D+ and D- from USB connector pin 2 to DM and pin 3 to MP Lines OK?
NO
Change Z5300 and V5300
YES
Measure voltage of RREF pin from R5300. Voltage 1.22V
NO
Change R5300
YES
YES
Measure voltages REG3V3 and REG1V8 pins from C5307/1 and C5307/2. Voltages stable 3.3V and 1.8V?
NO
Change capacitor C5307. Check VBAT from C5301 and VIO_APE from C5302. OK?
NO
Change capacitors C5301 and C5302. VBAT and VIO_APE OK?
YES
Check if D+ and D- signals are present on oscilloscope screen?
NO
Change D5300
YES
PC recognizes phone as USB device?
NO
Go to Application processor troubleshooting
YES
END
NO
Go to General power checking troubleshooting-APE

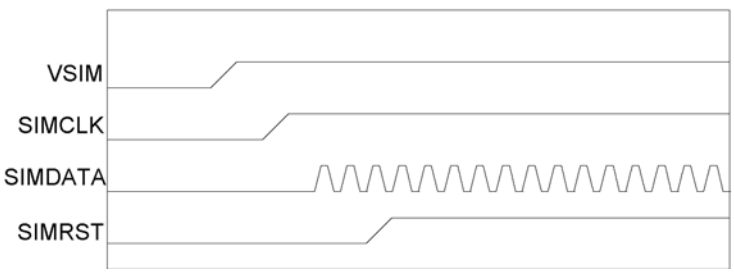
Copyright © 2008 Nokia. All rights reserved.

SIM card troubleshooting

Troubleshooting flow



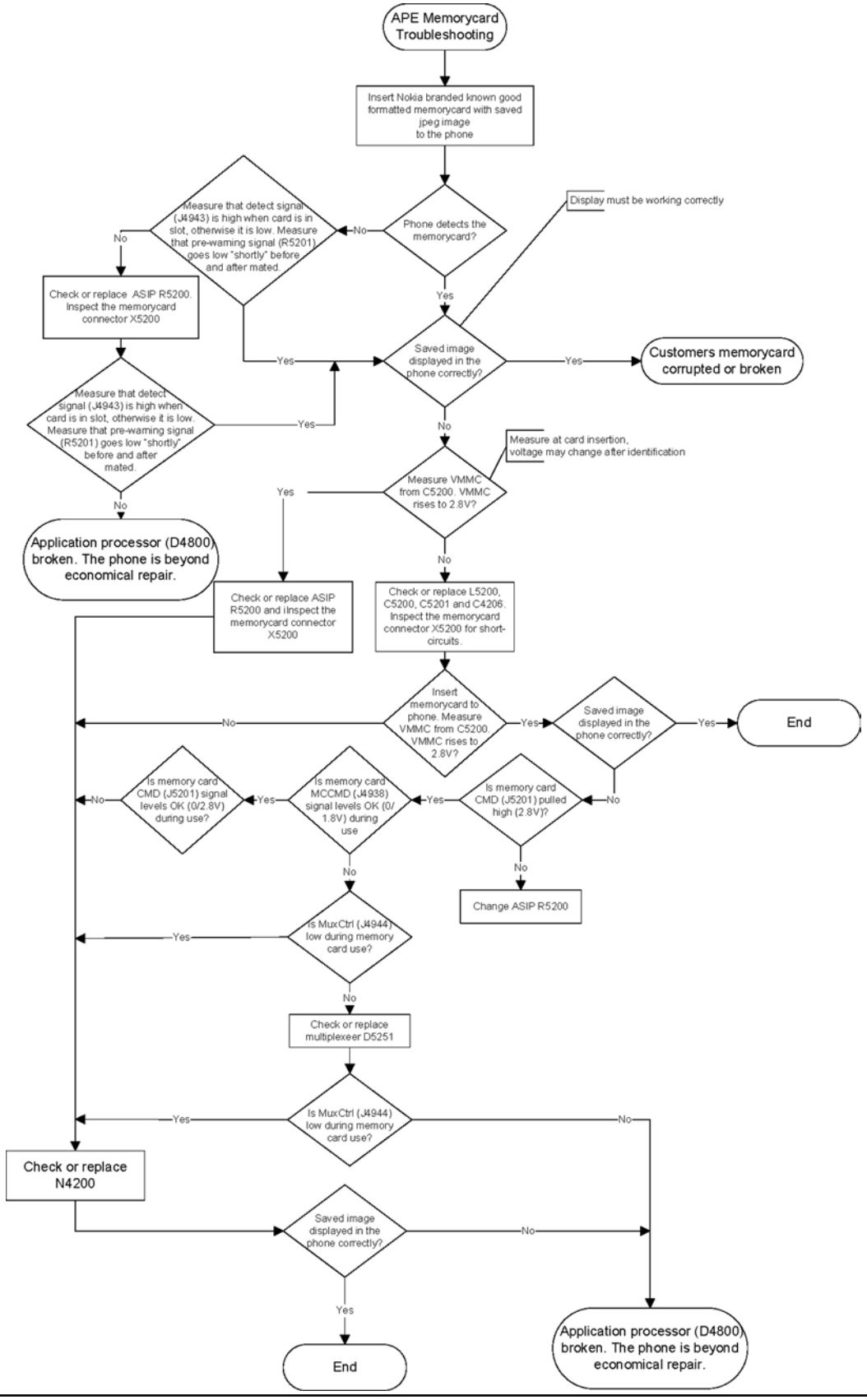
SIM power-up sequence



Copyright © 2008 Nokia. All rights reserved.

Memory card troubleshooting

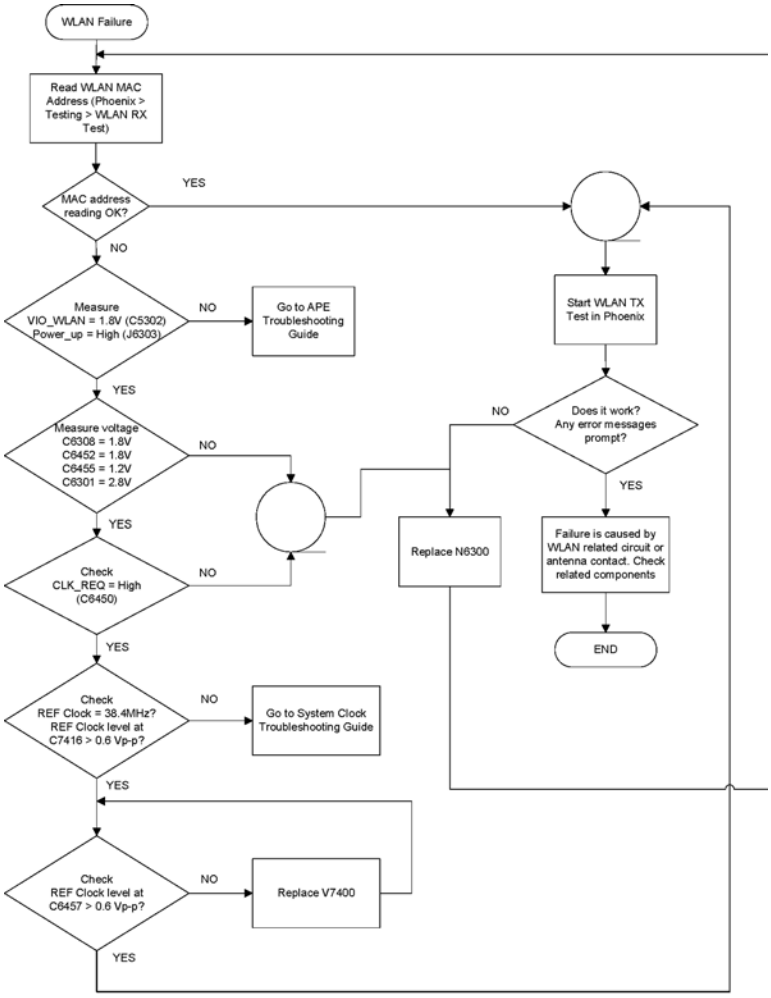
Troubleshooting flow


APE Memorycard Troubleshooting
Insert Nokia branded known good formatted memorycard with saved jpeg image to the phone
Phone detects the memorycard?
Display must be working correctly
Measure that detect signal (J4943) is high when card is in slot, otherwise it is low. Measure that pre-warning signal (R5201) goes low "shortly" before and after mated.
Check or replace ASIP R5200. Inspect the memorycard connector X5200
Saved image displayed in the phone correctly?
Customers memorycard corrupted or broken
Measure that detect signal (J4943) is high when card is in slot, otherwise it is low. Measure that pre-warning signal (R5201) goes low "shortly" before and after mated.
Measure at card insertion, voltage may change after identification
Measure VMMC from C5200. VMMC rises to 2.8V?
Application processor (D4800) broken. The phone is beyond economical repair.
Check or replace ASIP R5200 and inspect the memorycard connector X5200
Check or replace L5200, C5200, C5201 and C4206. Inspect the memorycard connector X5200 for short-circuits.
Insert memorycard to phone. Measure VMMC from C5200. VMMC rises to 2.8V?
Saved image displayed in the phone correctly?
End
Is memory card CMD (J5201) signal levels OK (0/2.8V) during use?
Is memory card MCCMD (J4938) signal levels OK (0/1.8V) during use
Is memory card CMD (J5201) pulled high (2.8V)?
Change ASIP R5200
Is MuxCtrl (J4944) low during memory card use?
Check or replace multiplexeer D5251
Is MuxCtrl (J4944) low during memory card use?
Check or replace N4200
Saved image displayed in the phone correctly?
End
Application processor (D4800) broken. The phone is beyond economical repair.

Copyright © 2008 Nokia. All rights reserved.

WLAN interface troubleshooting

Troubleshooting flow


WLAN Failure
Read WLAN MAC Address (Phoenix > Testing > WLAN RX Test)
MAC address reading OK?
YES
NO
Measure VIO_WLAN = 1.8V (C5302) Power_up = High (J6303)
NO
Go to APE Troubleshooting Guide
YES
Measure voltage C6308 = 1.8V C6452 = 1.8V C6455 = 1.2V C6301 = 2.8V
NO
YES
Check CLK_REQ = High (C6450)
NO
YES
Check REF Clock = 38.4MHz? REF Clock level at C7416 > 0.6 Vp-p?
NO
Go to System Clock Troubleshooting Guide
YES
Check REF Clock level at C6457 > 0.6 Vp-p?
NO
Replace V7400
YES
Start WLAN TX Test in Phoenix
Does it work? Any error messages prompt?
NO
YES
Replace N6300
Failure is caused by WLAN related circuit or antenna contact. Check related components
END

Keyboard troubleshooting

Context

There are two possible failure modes in the keyboard module:

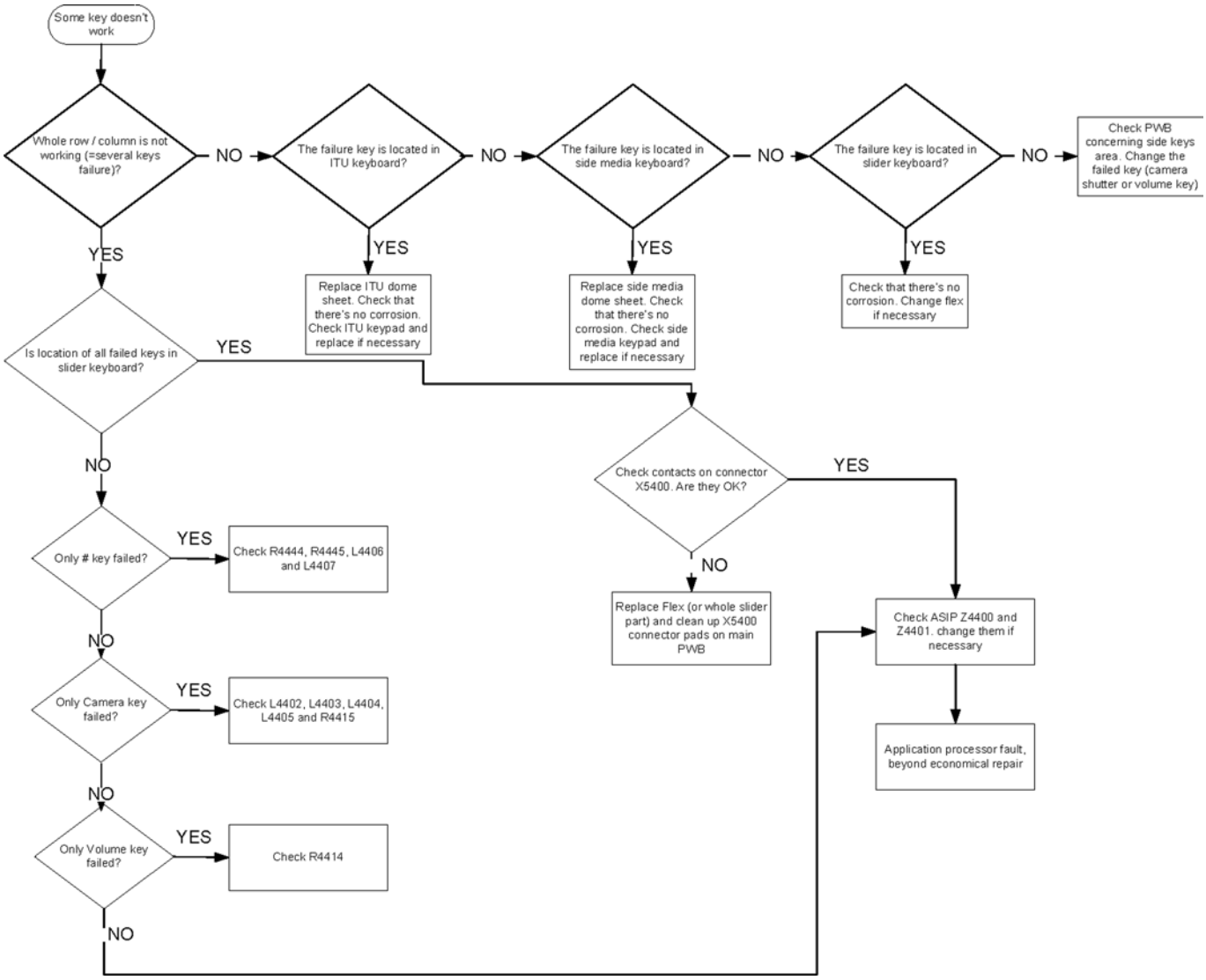
1 One or more keys are stuck, so that the key(s) does not react when you press a keydome. This kind of failure is caused by mechanical reasons (dirt, corrosion).

2 Malfunction of several keys at the same time; this happens when one or more rows or columns are failing (shortcut or open connection). For a more detailed description of the keyboard and keymatrix, see section **Keyboard**.

If the failure mode is not clear, start with the **Keyboard Test** in *Phoenix*.

Copyright © 2008 Nokia. All rights reserved.

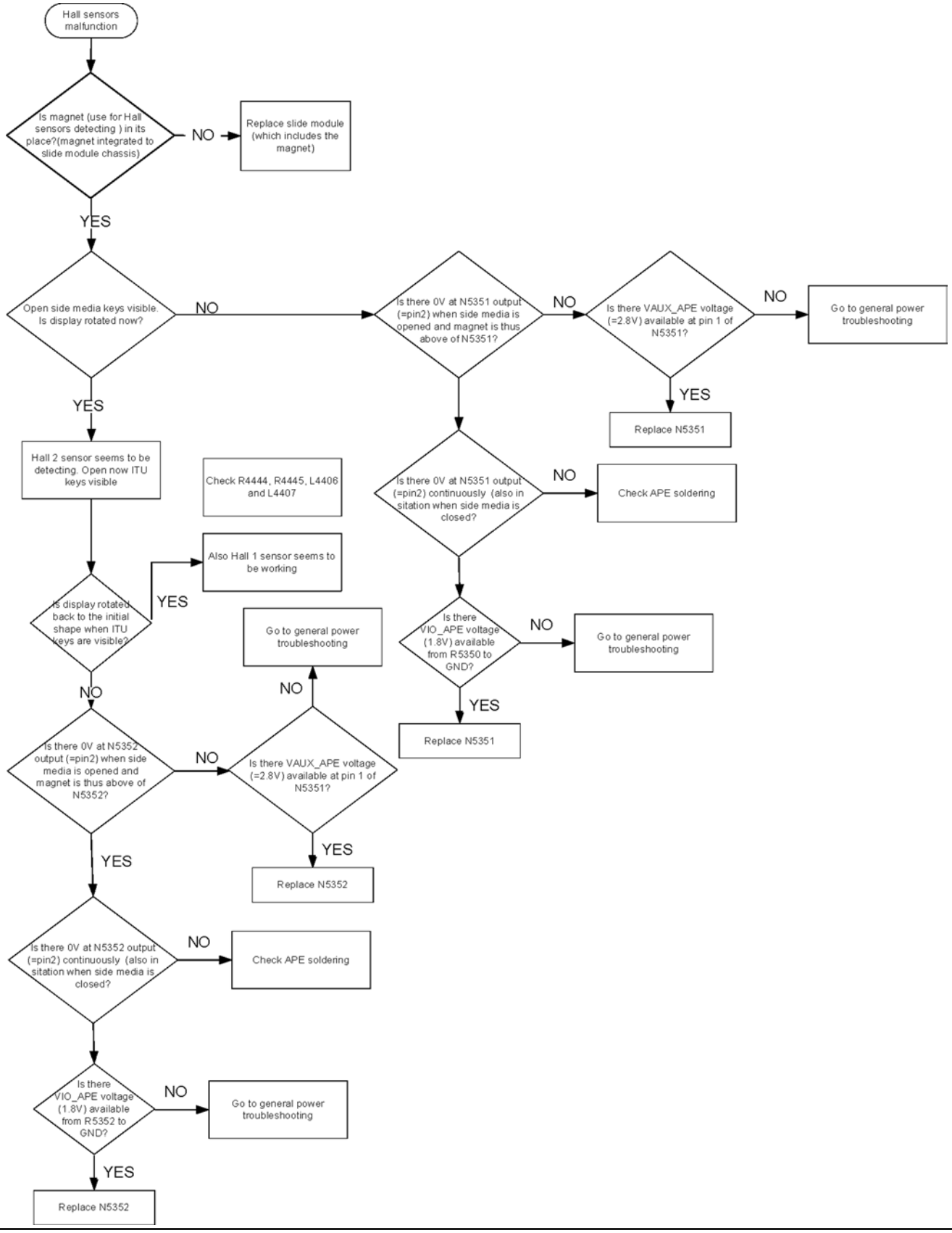
Troubleshooting flow


Some key doesn't work
Whole row / column is not working (=several keys failure)?
NO
The failure key is located in ITU keyboard?
NO
The failure key is located in side media keyboard?
NO
The failure key is located in slider keyboard?
NO
Check PWB concerning side keys area. Change the failed key (camera shutter or volume key)
YES
YES
YES
YES
Replace ITU dome sheet. Check that there's no corrosion. Check ITU keypad and replace if necessary
Replace side media dome sheet. Check that there's no corrosion. Check side media keypad and replace if necessary
Check that there's no corrosion. Change flex if necessary
Is location of all failed keys in slider keyboard?
YES
NO
Check contacts on connector X5400. Are they OK?
YES
NO
Only # key failed?
YES
Check R4444, R4445, L4406 and L4407
NO
Only Camera key failed?
YES
Check L4402, L4403, L4404, L4405 and R4415
NO
Only Volume key failed?
YES
Check R4414
NO
Replace Flex (or whole slider part) and clean up X5400 connector pads on main PWB
Check ASIP Z4400 and Z4401. change them if necessary
Application processor fault, beyond economical repair

Copyright © 2008 Nokia. All rights reserved.

Hall sensor troubleshooting

Troubleshooting flow


Hall sensors malfunction
Is magnet (use for Hall sensors detecting) in its place?(magnet integrated to slide module chassis)
NO
Replace slide module (which includes the magnet)
YES
Open side media keys visible. Is display rotated now?
NO
Is there 0V at N5351 output (=pin2) when side media is opened and magnet is thus above of N5351?
NO
Is there VAUX_APE voltage (=2.8V) available at pin 1 of N5351?
NO
Go to general power troubleshooting
YES
Replace N5351
YES
Hall 2 sensor seems to be detecting. Open now ITU keys visible
Check R4444, R4445, L4406 and L4407
Is there 0V at N5351 output (=pin2) continuously (also in sitation when side media is closed?
NO
Check APE soldering
Also Hall 1 sensor seems to be working
Is display rotated back to the initial shape when ITU keys are visible?
YES
Go to general power troubleshooting
Is there VIO_APE voltage (1.8V) available from R5350 to GND?
NO
Go to general power troubleshooting
NO
YES
Replace N5351
NO
Is there 0V at N5352 output (=pin2) when side media is opened and magnet is thus above of N5352?
NO
Is there VAUX_APE voltage (=2.8V) available at pin 1 of N5351?
YES
Replace N5352
YES
Is there 0V at N5352 output (=pin2) continuously (also in sitation when side media is closed?
NO
Check APE soldering
Is there VIO_APE voltage (1.8V) available from R5352 to GND?
NO
Go to general power troubleshooting
YES
Replace N5352

Copyright © 2008 Nokia. All rights reserved.

FM radio troubleshooting

Context

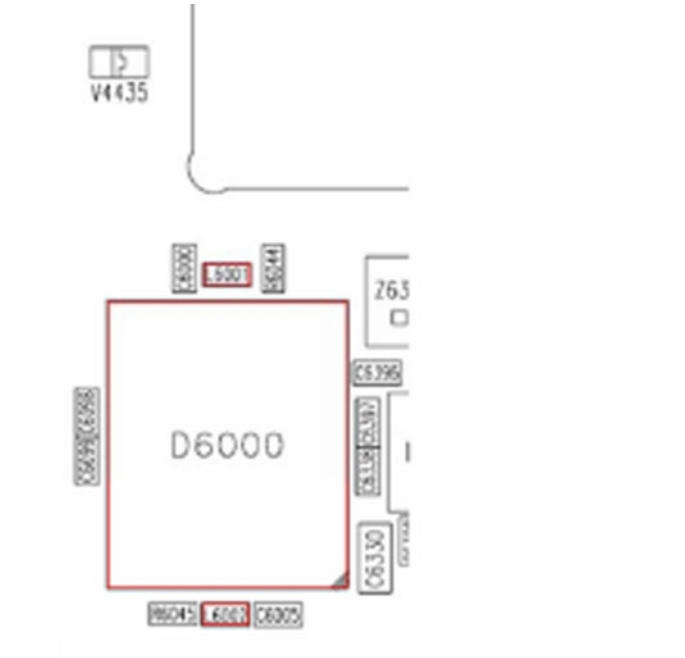


Figure 18 FM radio placement on the top side

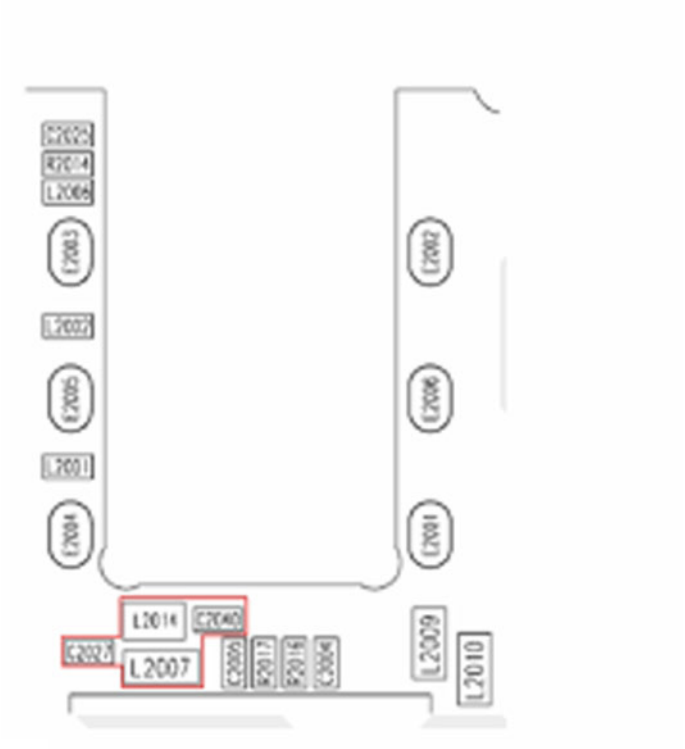
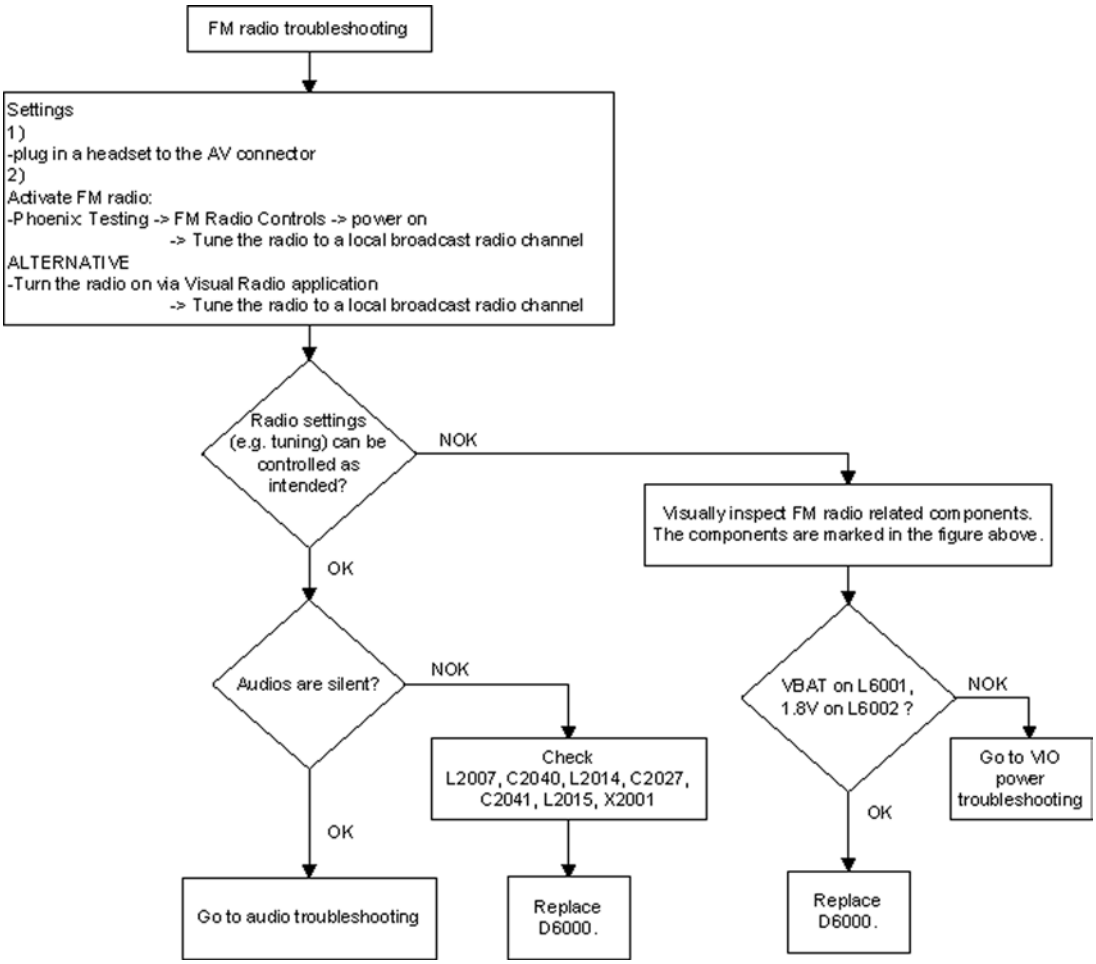


Figure 19 FM radio placement on the bottom side

Copyright © 2008 Nokia. All rights reserved.

Troubleshooting flow


FM radio troubleshooting
Settings
1)
-plug in a headset to the AV connector
2)
Activate FM radio:
-Phoenix Testing -> FM Radio Controls -> power on
-> Tune the radio to a local broadcast radio channel
ALTERNATIVE
-Turn the radio on via Visual Radio application
-> Tune the radio to a local broadcast radio channel
Radio settings (e.g. tuning) can be controlled as intended?
NOK
OK
Visually inspect FM radio related components. The components are marked in the figure above.
Audios are silent?
NOK
OK
Check L2007, C2040, L2014, C2027, C2041, L2015, X2001
Go to audio troubleshooting
Replace D6000.
VBAT on L6001, 1.8V on L6002 ?
NOK
OK
Go to VIO power troubleshooting
Replace D6000.

Certificate restoring for BB5 products

Context

This procedure is performed when the device flash content is changed or corrupted.

All tunings (RF & Baseband, UI) must be done after performing the certificate restoring procedure.

The procedure for certificate restoring is the following:

- Flash the phone with the latest available software using FLS-5 or FPS-10.

  Note: USB flashing does not work if certificates and IMEI are missing from the phone.
- Create a request file.
- Send the file to Nokia by e-mail. Use the following addresses depending on your location:
  - APAC: sydney.service@nokia.com
  - CHINA: repair.ams@nokia.com
  - E&A: salo.repair@nokia.com
- When you receive a reply from Nokia, carry out certificate restoring.
- Tune the phone completely.

  Note: The request won't be accepted without a SX-4 smart card. Before the request, the smart card must be registered in the online database.

Copyright © 2008 Nokia. All rights reserved.

- If the phone resets after certificate restoring, reflash the phone again.

Required equipment and setup:

- Latest *Phoenix* service software.
- The latest phone model specific *Phoenix* data package.
- PKD-1 dongle
- SX-4 smart card (Enables BB5 testing and tuning features)
- External smart card reader

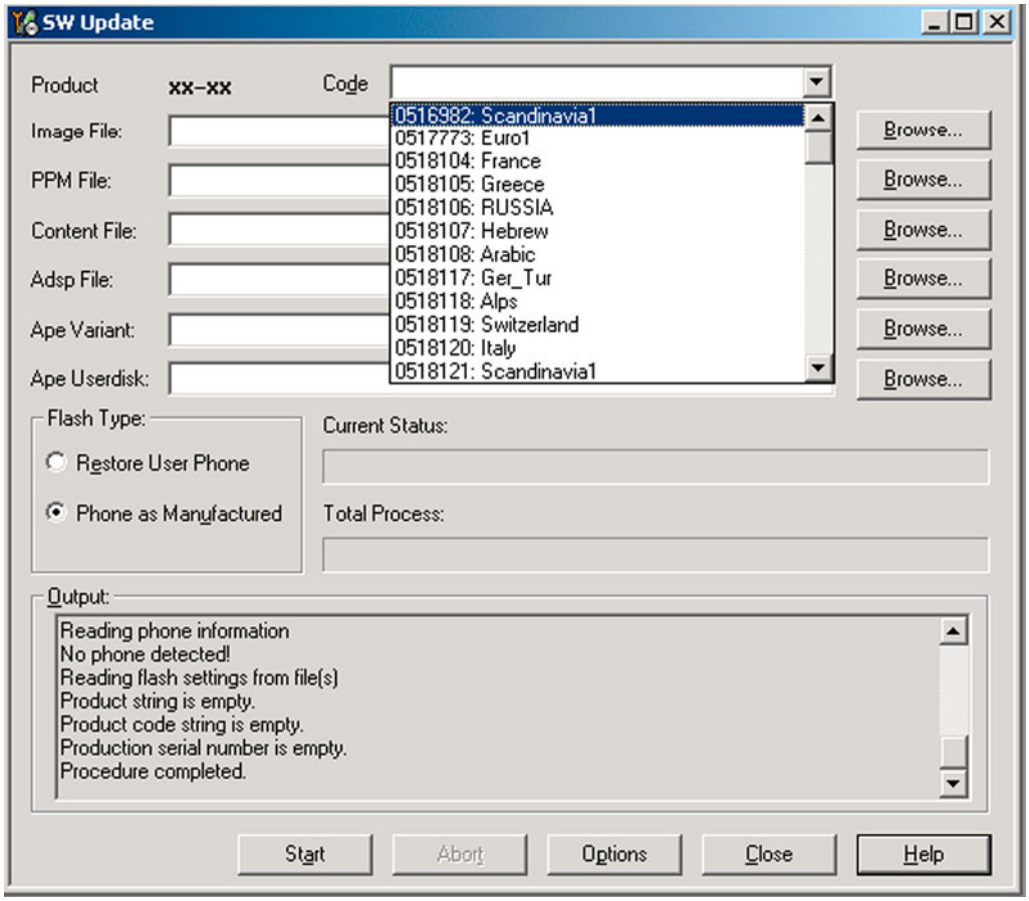
  Note: The smart card reader is only needed when FLS-5 is used. FPS-10 has an integrated smart card reader.
- Activated FLS-5 flash device **OR** FPS-10 flash prommer
- The latest flash update package for FLS-5 flash device or FPS-10 flash prommer
- CU-4 control unit
- USB cable from PC USB Port to CU-4 control unit
- Phone model specific adapter for CU-4 control unit
- PCS-1 cable to power CU-4 from external power supply
- XCS-4 modular cable between flash prommer and CU-4

  Note: CU-4 must be supplied with +12 V from an external power supply in all steps of certificate restoring.

Steps

1. Program the phone software.
   i Start *Phoenix* and login. Make sure the connection has been managed correctly for FLS-5 or FPS-10.
   ii Update the phone MCU software to the latest available version.
   If the new flash is empty and the phone cannot communicate with *Phoenix*, reflash the phone.
   iii Choose the product manually from **File→Open Product** , and click **OK**.
   Wait for the phone type designator (e.g. “RM-1”) to be displayed in the status bar.
   iv Go to **Flashing→Firmware Update** and wait until *Phoenix* reads the product data as shown in the following picture.

Copyright © 2008 Nokia. All rights reserved.

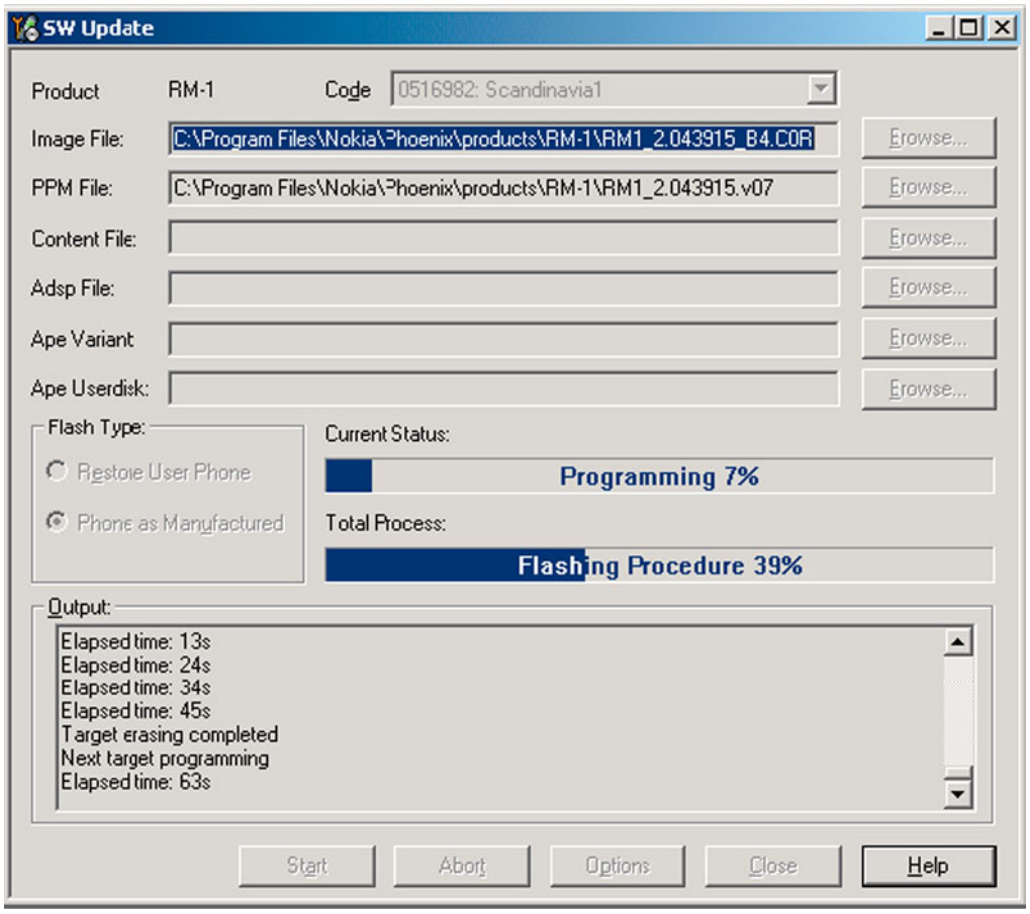


Product	is automatically set according to the phone support module which was opened manually, but the flash files cannot be found because the correct data cannot be read from the phone automatically.
Code	must be chosen manually, it determines the correct flash files to be used. Please choose the correct product code (can be seen in the phone type label) from the dropdown list.
Flash Type	must be set to **Phone as Manufactured**.

v To continue, click **Start**.

Progress bars and messages on the screen show actions during phone programming, please wait.

Copyright © 2008 Nokia. All rights reserved.



Programming is completed when Flashing Completed message is displayed.

The product type designator and MCU SW version are displayed in the status bar.

vi Close the *SW Update* window and then choose **File→Close Product** .

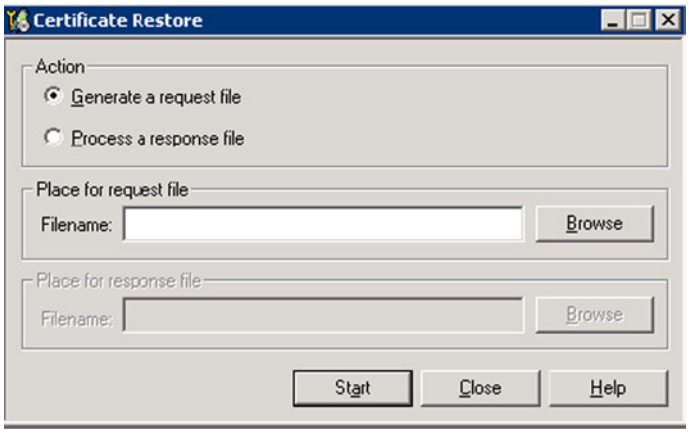
2. Create a *Request* file.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

i To connect the phone with *Phoenix*, choose **File→Scan Product** .

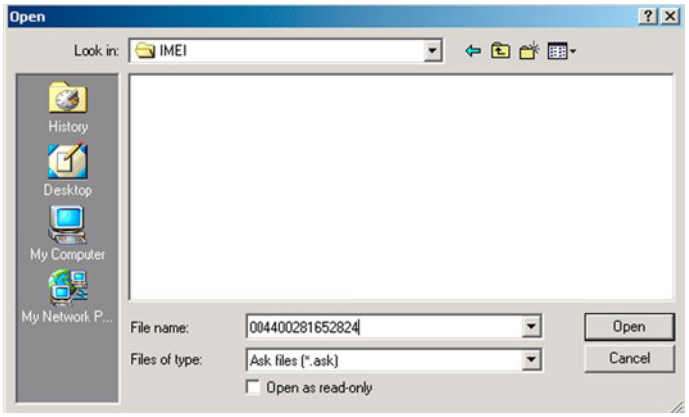
ii Choose **Tools→Certificate Restore** .

iii To choose a location for the request file, click **Browse**.

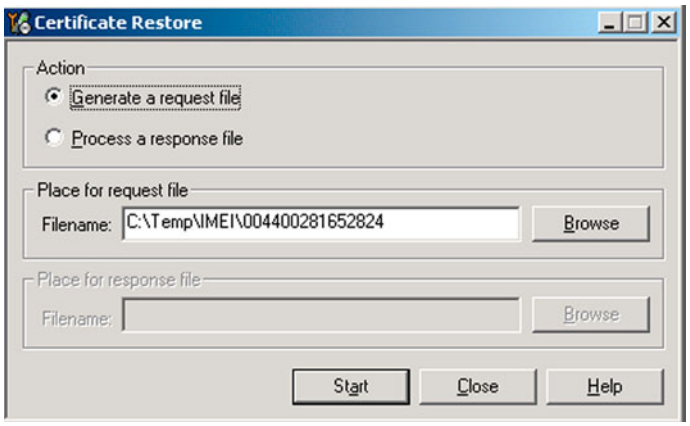


Copyright © 2008 Nokia. All rights reserved.

iv Name the file so that you can easily identify it, and click **Open**.



The name of the file and its location are shown.



v To create the *Request* file, click **Start**.

vi When the file for certificate restore has been created, send it to Nokia as an e-mail attachment.

3. Restore certificate.

For this procedure, you must supply +12 V to CU-4 from an external power supply.

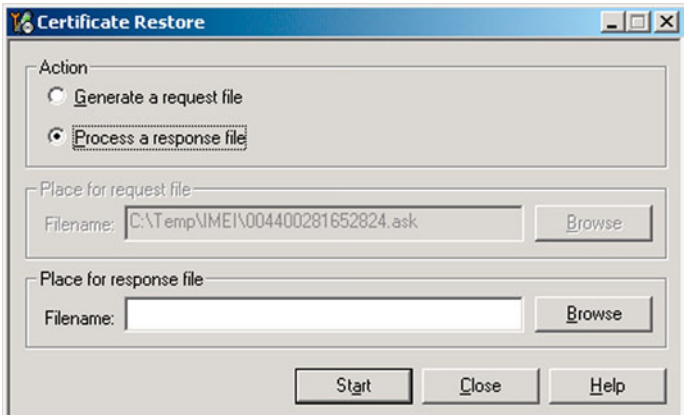
i Save the reply file sent by Nokia to your computer.

ii Start *Phoenix* service software.

iii Choose **File→Scan Product** .

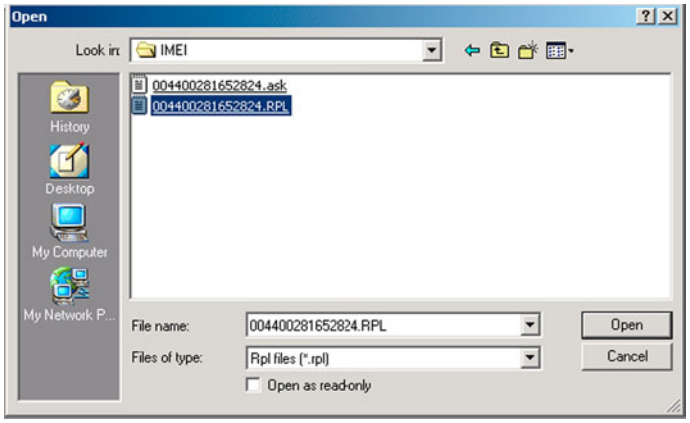
Copyright © 2008 Nokia. All rights reserved.

iv From the **Tools** menu, choose **Certificate Restore** and select **Process a response file** in the *Action* pane.



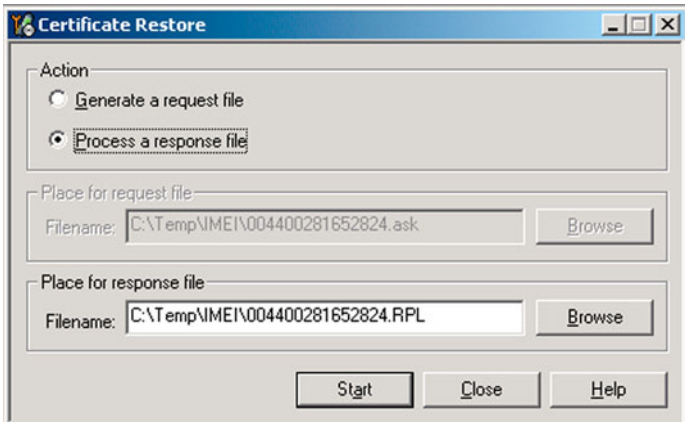
v To choose the location where response file is saved, click **Browse**.

vi Click **Open**.



The name of the file and the path where it is located are shown.

vii To write the file to phone, click **Start**.



Next actions

After a successful rewrite, you must retune the phone completely by using *Phoenix* tuning functions.

Important: Perform all tunings: RF, BB, and UI.

Copyright © 2008 Nokia. All rights reserved.

GPS troubleshooting

GPS layout and basic test points

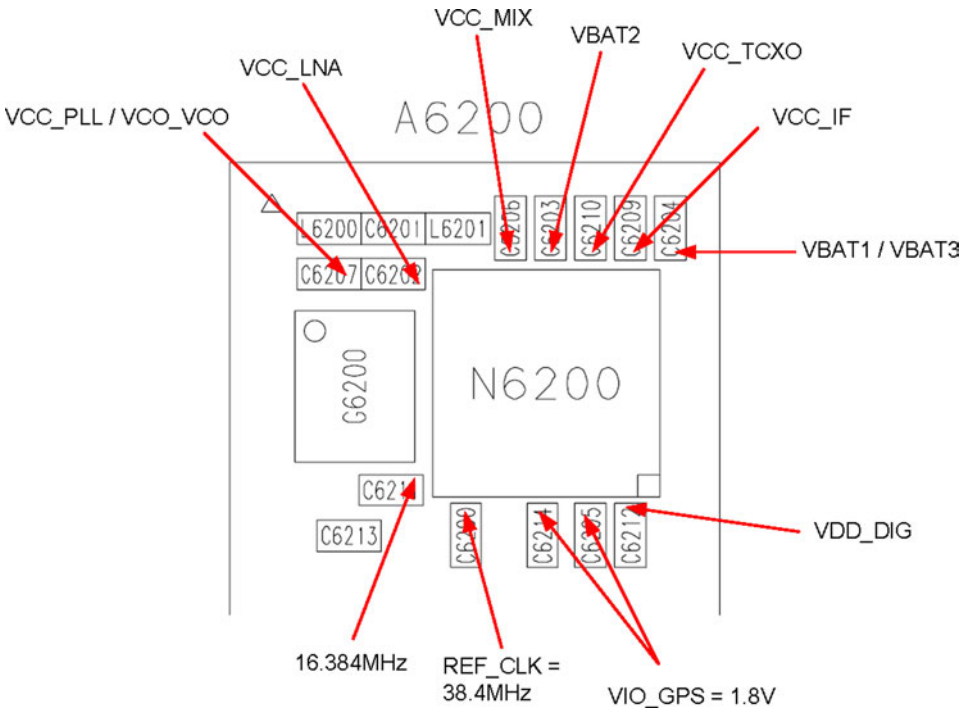


Figure 20 GPS layout and basic test points

VBat, ASIC internal LDO voltages, and clocks are available as shown in figure above. In addition to these, the following GPS signals are available on the test points:

- GPS_En_Reset – J6206
- U2Tx – J6209 (Activity on this pin indicates the GPS is operating.)
- IO_INT_U1CLK – J6207
- IO_TIMESTAMP_DATRDY – J6208
- SleepX – J2802
- Sleep Clk (RTC) – J2217

GPS settings for Phoenix

GPS control

Context

Use the following to test GPS using Phoenix.

Steps

1. Start Phoenix service software.
2. From the **File** menu, select **Scan Product** and check that the correct product version is displayed.

Copyright © 2008 Nokia. All rights reserved.

3. From the **Testing** menu, select **GPS Control**. This opens up *GPS Control* dialogue box, as shown in the figure below, and enables the GPS.

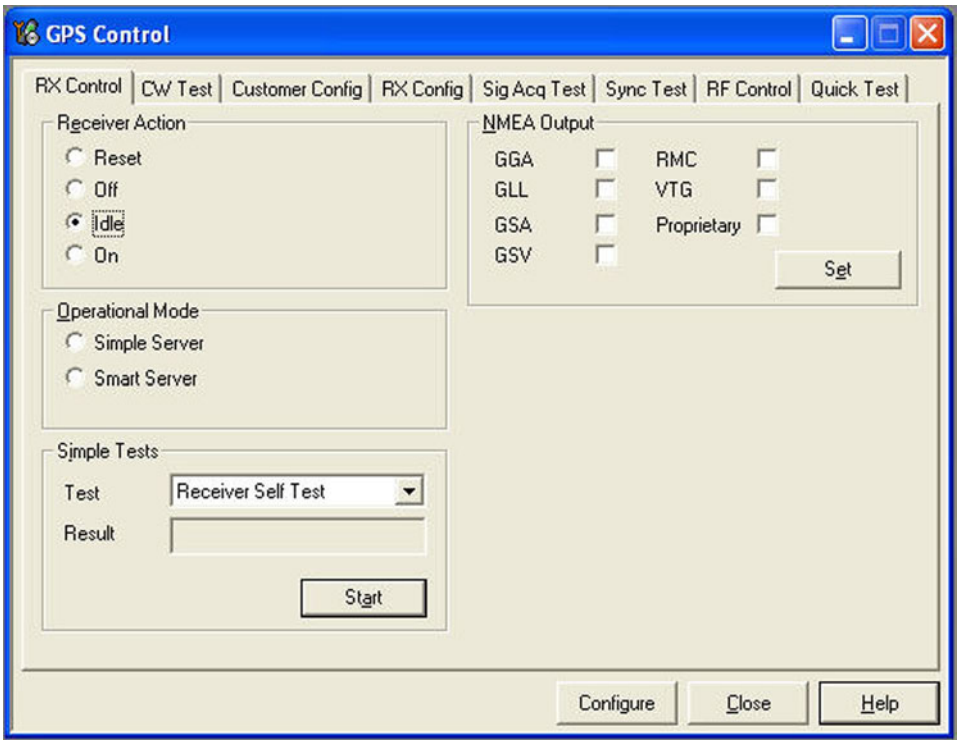


Figure 21 GPS Control dialog box

Select **Idle** to confirm the GPS is enabled and is in idle mode; at this point all clocks should be present, GPS_En_Reset & SleepX should be high, and Vdd_Dig, Vcc_TCXO & Vcc_PLL/VCO will be present.

Receiver On turns on all RF sections of the ASIC and so all LDOs will be on. These checks are part of *GPS basic checks troubleshooting*.

Quick Test window

The *Quick Test* window has all the necessary functionality for GPS troubleshooting. Ensure the test setup is correct and click **Start Test**. (Select **Help** for further information).

This test will perform 3 tests in one; Self Test, Oscillator Test and CW Test, and will provide a Pass/Fail response. It also contains a Receiver On button. These checks are part of *GPS troubleshooting*.

Copyright © 2008 Nokia. All rights reserved.

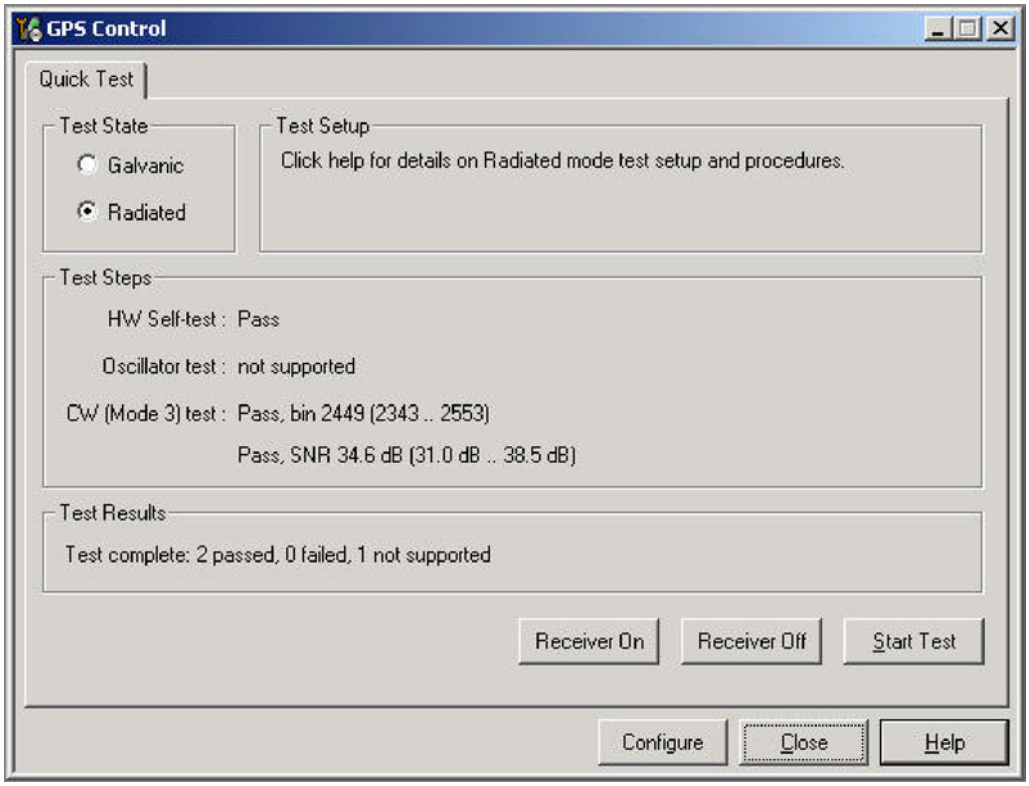


Figure 22 GPS Quick Test window for GPS troubleshooting

GPS RF test points

The GPS antenna test pads are located on the top side under the keymat as shown in figure "GPS antenna test pads". Checking for a connection between these two test points will confirm that the antenna is working correctly, as well as performing a radiated CW test.

J6210 = GPS Ant

J6211 = GPS Ant Gnd

In order to probe GPS RF test points, inject 1575.52 MHz tone @ -50dBm at the GPS antenna test connector and select **Receiver On**, then probe the GPS RF test points as shown in figure "GPS RF probe points". Compare RF levels with a known reference phone.

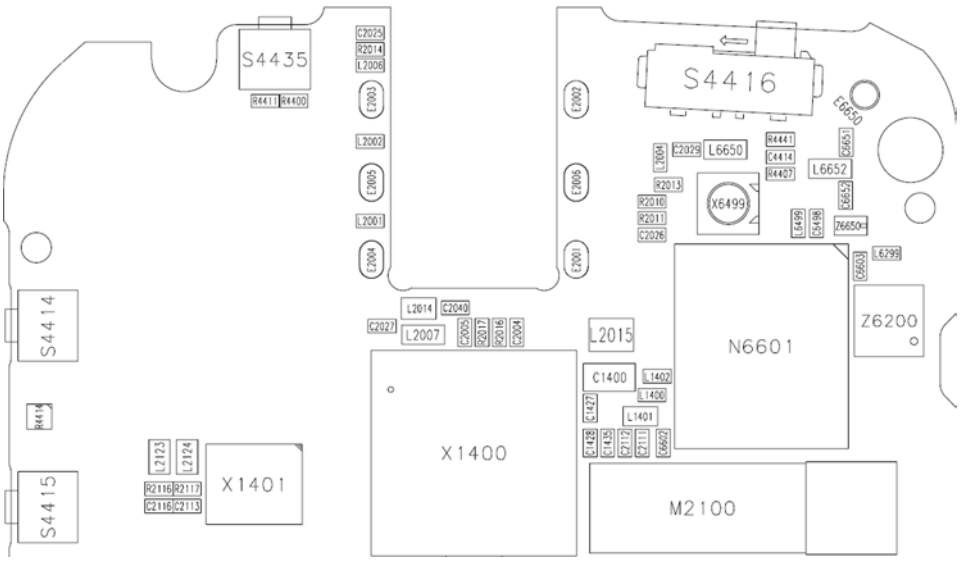


Figure 23 GPS antenna test pads

Copyright © 2008 Nokia. All rights reserved.

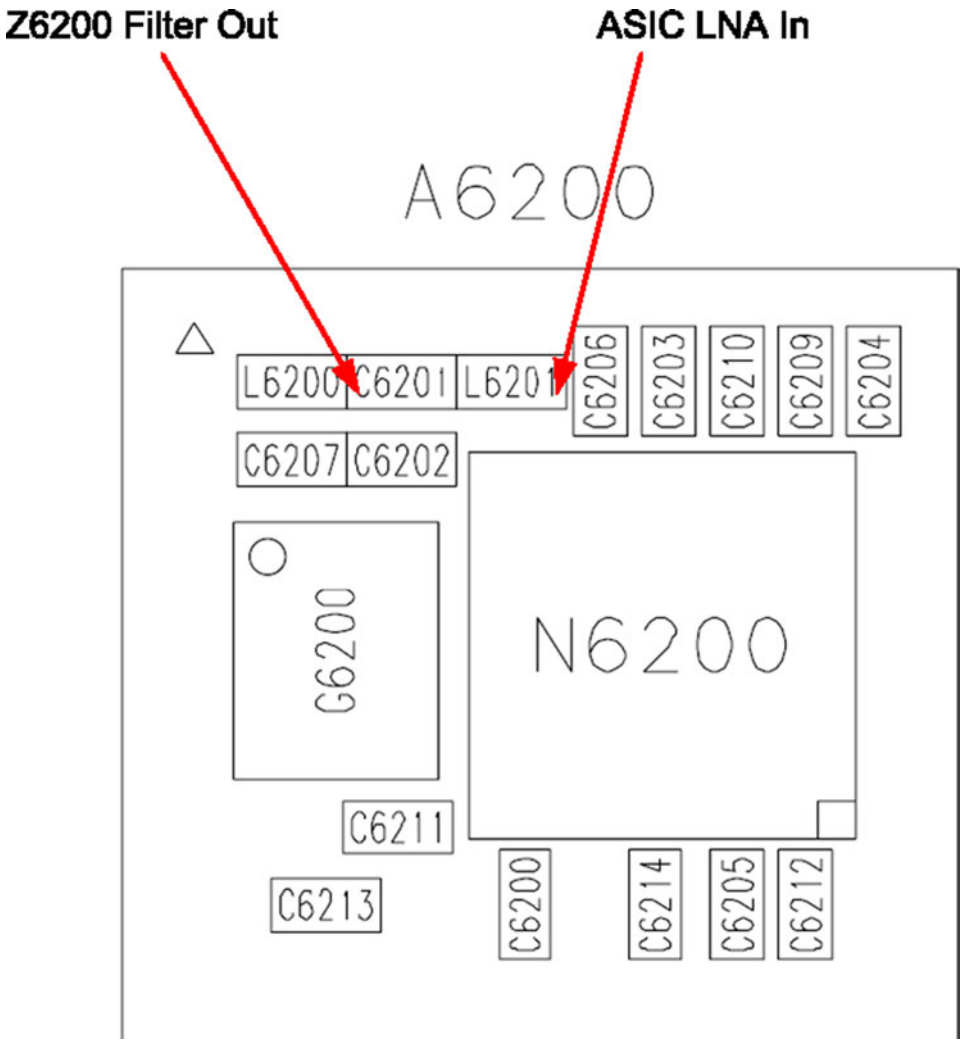


Figure 24 GPS RF probe points

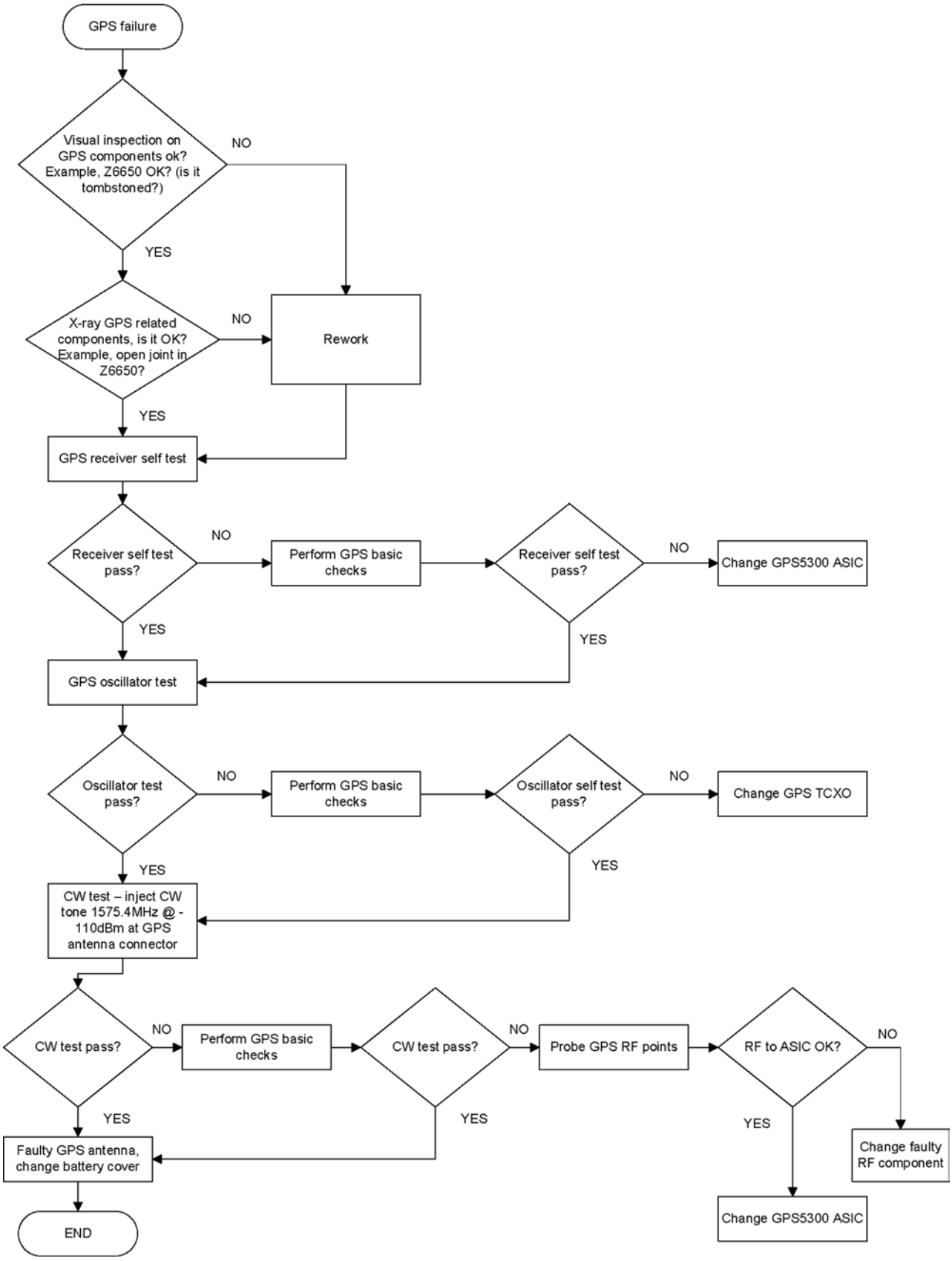
GPS failure troubleshooting

Context

GPS troubleshooting is broken down into two parts: general GPS failure & GPS basic checks. The GPS failure troubleshooting flow can be followed and, where applicable, will feed into the Basic checks troubleshooting flow.

Copyright © 2008 Nokia. All rights reserved.

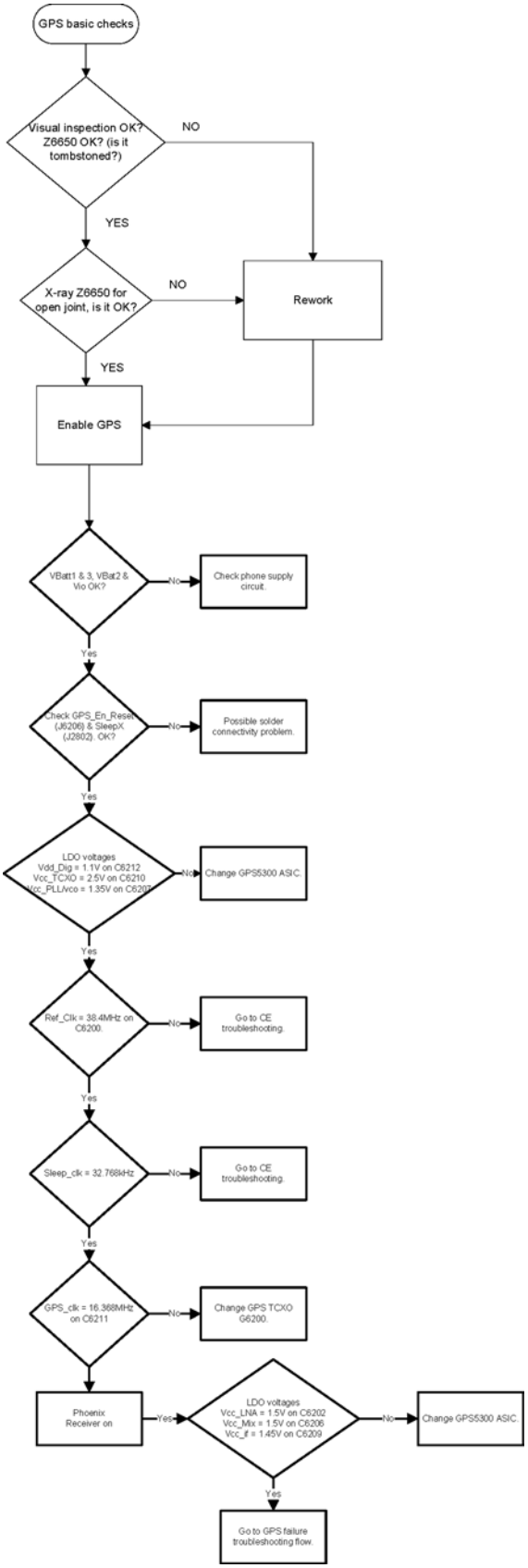
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

GPS basic checks troubleshooting

Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Display module troubleshooting

General instructions for display troubleshooting

Context

- The display is in a normal mode when the phone is in active use.
- Display is in a partial idle mode when the phone is in the screen saver mode.
- The operating modes of the display can be controlled with the help of *Phoenix*.

Table 9 Display module troubleshooting cases

Display blank	There is no image on the display. The display looks the same when the phone is on as it does when the phone is off. The backlight can be on in some cases.
Image on the display not correct	Image on the display can be corrupted or a part of the image can be missing. If a part of the image is missing, change the display module. If the image is otherwise corrupted, follow the appropriate troubleshooting diagram.
Backlight dim or not working at all	Backlight LED components are inside the display module. Backlight failure can also be in the connector or in the backlight power source in the main engine of the phone. This means that in case the display is working (image OK), the backlight is faulty.
Visual defects (pixel)	Pixel defects can be checked by controlling the display with Phoenix. Use both colours, black and white, on a full screen. The display may have some random pixel defects that are acceptable for this type of display. The criteria when pixel defects are regarded as a display failure, resulting in a replacement of the display, are presented the following table.

Table 10 Pixel defects

Item		White dot defect				Black dot defect	Total
1	Defect counts	R	G	B	White Dot Total	1	1
		1	1	1	1		
2	Combined defect counts	Not allowed. Two single dot defects that are within 5 mm of each other should be interpreted as combined dot defect.					

Copyright © 2008 Nokia. All rights reserved.

Steps

1. Verify with a working display that the fault is not on the display module itself.

   The display module cannot be repaired.

2. Check that the cellular engine is working normally.
   i To check the functionality, connect the phone to a docking station.
   ii Start *Phoenix* service software.
   iii Read the phone information to check that also the application engine is functioning normally (you should be able to read the APE ID).

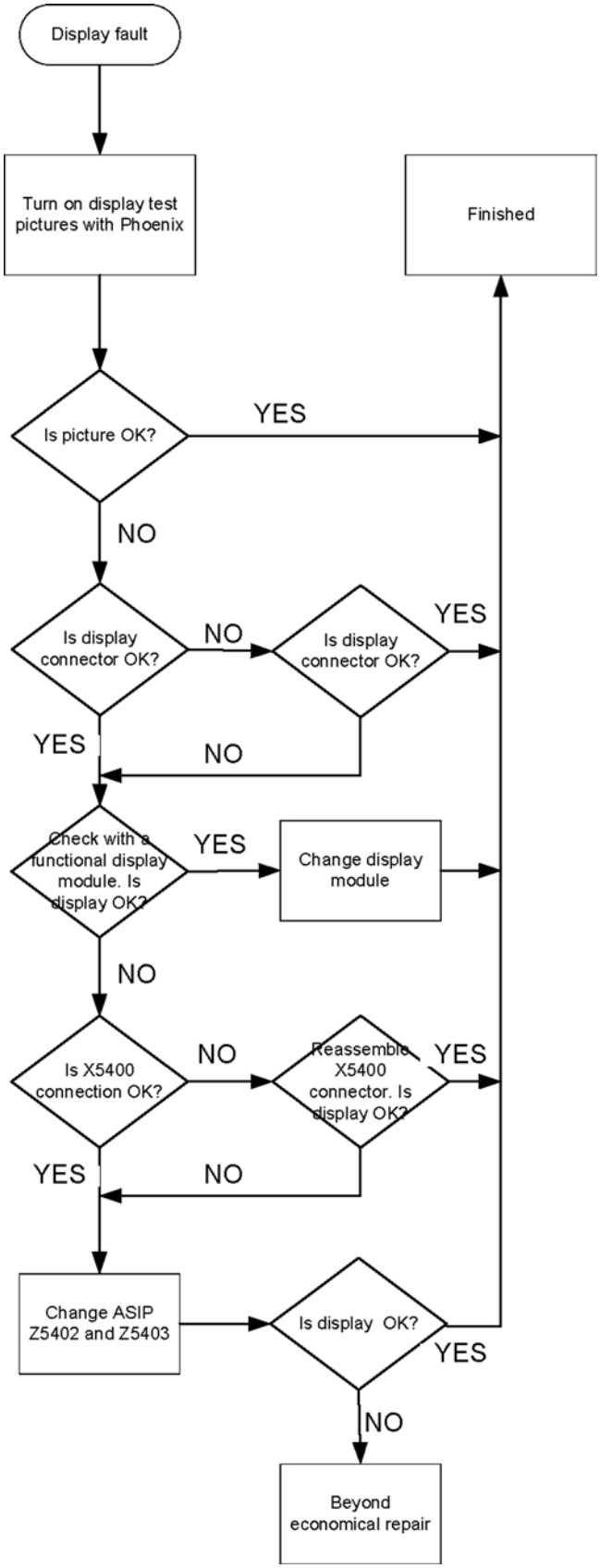
3. Proceed to the display troubleshooting flowcharts.

   Use the **Display Test** tool in *Phoenix* to find the detailed fault mode.

Copyright © 2008 Nokia. All rights reserved.

Display troubleshooting

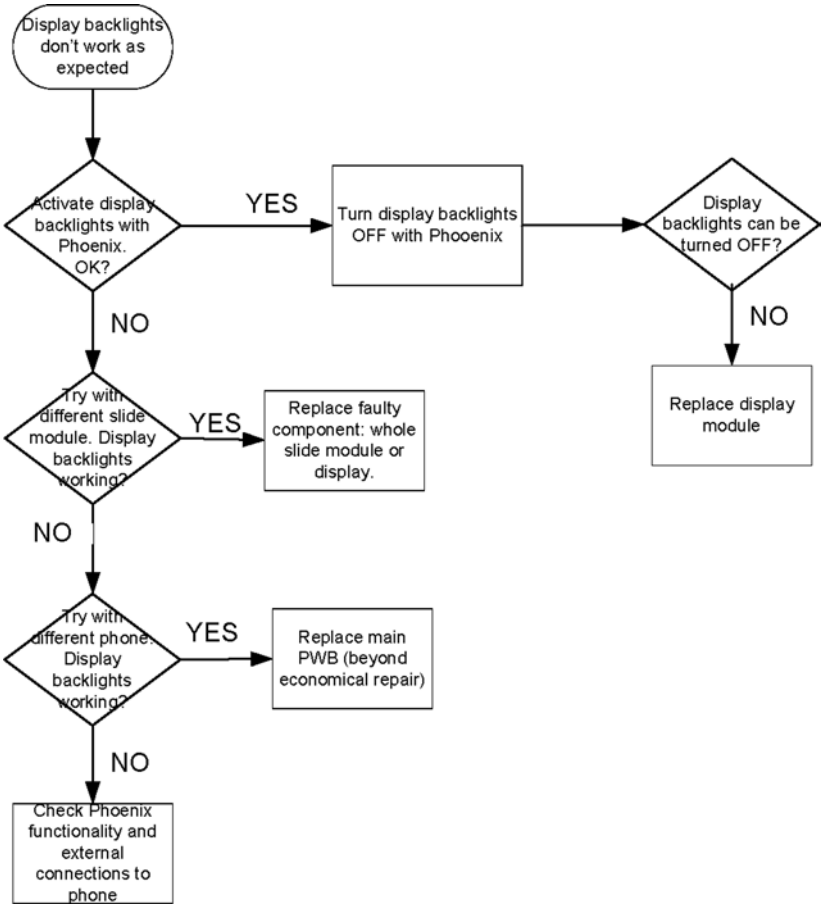
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Display backlight troubleshooting

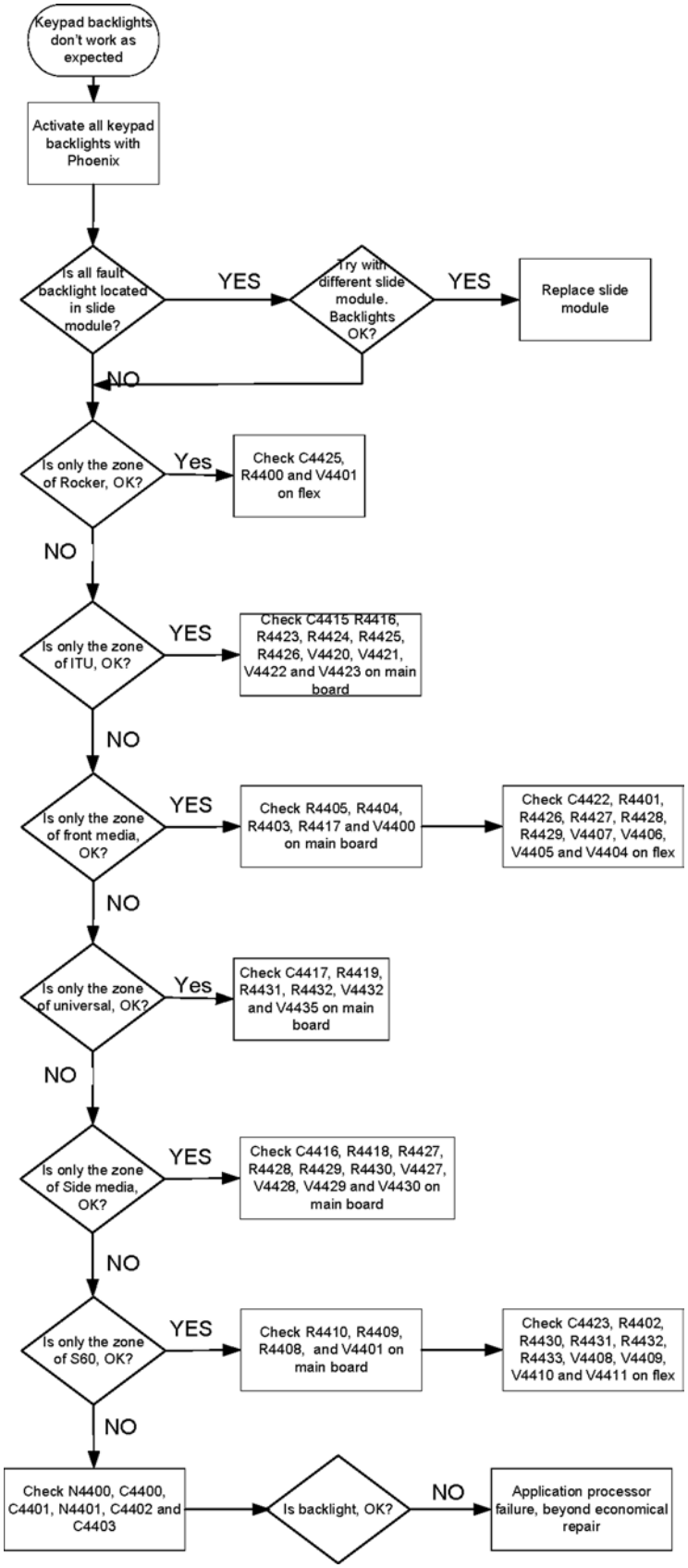
Troubleshooting flow


Display backlights don't work as expected
Activate display backlights with Phoenix. OK?
YES
Turn display backlights OFF with Phooenix
Display backlights can be turned OFF?
NO
Replace display module
NO
Try with different slide module. Display backlights working?
YES
Replace faulty component: whole slide module or display.
NO
Try with different phone. Display backlights working?
YES
Replace main PWB (beyond economical repair)
NO
Check Phoenix functionality and external connections to phone

Copyright © 2008 Nokia. All rights reserved.

Keypad backlight troubleshooting

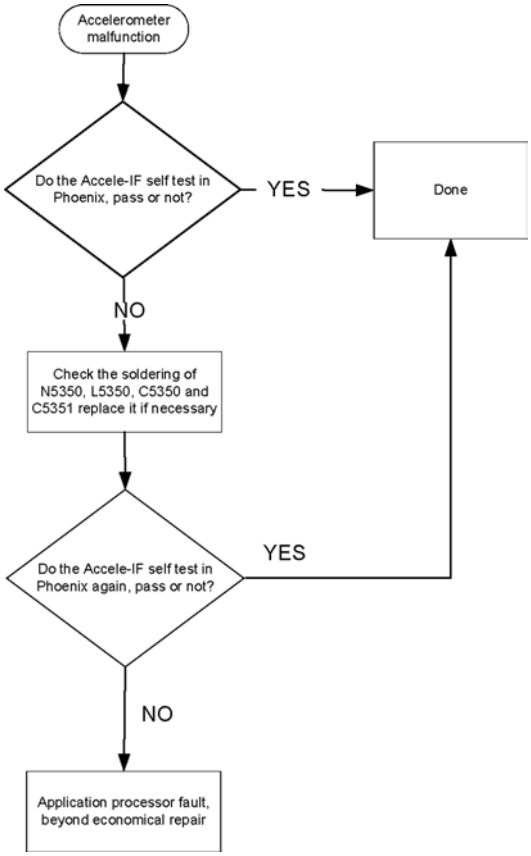
Troubleshooting flow


Keypad backlights don't work as expected
Activate all keypad backlights with Phoenix
Is all fault backlight located in slide module?
YES
Try with different slide module. Backlights OK?
YES
Replace slide module
NO
Is only the zone of Rocker, OK?
Yes
Check C4425, R4400 and V4401 on flex
NO
Is only the zone of ITU, OK?
YES
Check C4415 R4416, R4423, R4424, R4425, R4426, V4420, V4421, V4422 and V4423 on main board
NO
Is only the zone of front media, OK?
YES
Check R4405, R4404, R4403, R4417 and V4400 on main board
Check C4422, R4401, R4426, R4427, R4428, R4429, V4407, V4406, V4405 and V4404 on flex
NO
Is only the zone of universal, OK?
Yes
Check C4417, R4419, R4431, R4432, V4432 and V4435 on main board
NO
Is only the zone of Side media, OK?
YES
Check C4416, R4418, R4427, R4428, R4429, R4430, V4427, V4428, V4429 and V4430 on main board
NO
Is only the zone of S60, OK?
YES
Check R4410, R4409, R4408, and V4401 on main board
Check C4423, R4402, R4430, R4431, R4432, R4433, V4408, V4409, V4410 and V4411 on flex
NO
Check N4400, C4400, C4401, N4401, C4402 and C4403
Is backlight, OK?
NO
Application processor failure, beyond economical repair

Copyright © 2008 Nokia. All rights reserved.

Accelerometer troubleshooting

Troubleshooting flow


Accelerometer malfunction
Do the Accele-IF self test in Phoenix, pass or not?
YES
Done
NO
Check the soldering of N5350, L5350, C5350 and C5351 replace it if necessary
Do the Accele-IF self test in Phoenix again, pass or not?
YES
NO
Application processor fault, beyond economical repair

Backlights controlling in Phoenix

Backlights controlling in Phoenix

There are 7 different light zones, including display, S60, ITU, sidemedia, Navi, gaming and frontmedia. Display backlight is powered by battery and controlled by LCD internal driver. The control commands are sent from Rapido through Messi8 interface. The rest of the zones are powered and controlled by two Njoys (LP5521), which are controlled by Rapido through I2C bus.

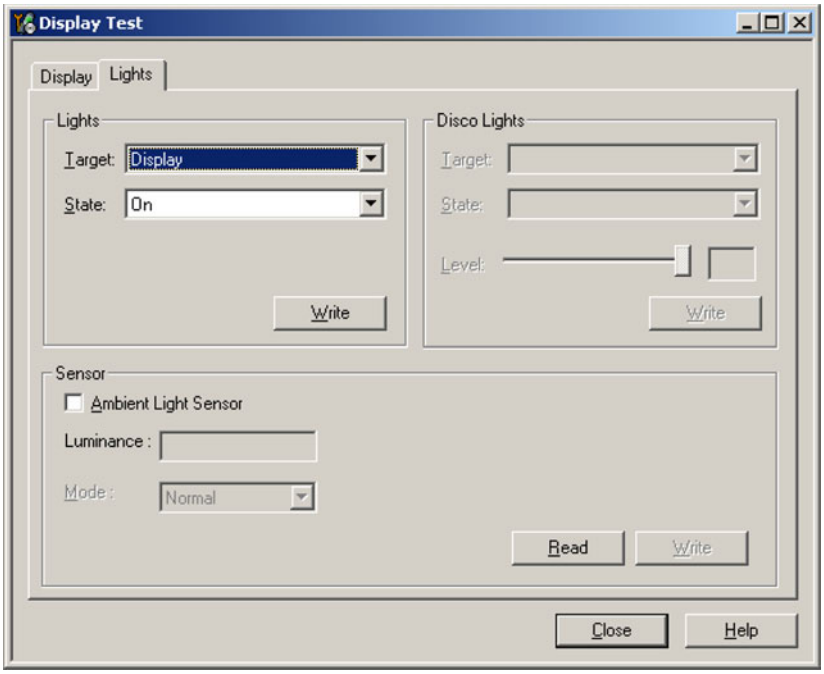
Switching display lighting ON using Phoenix

Steps

1. Connect phone to *Phoenix*.
2. Start *Phoenix*.
3. Choose **File→Scan Product** .
4. Choose **Display→Display test** .

Copyright © 2008 Nokia. All rights reserved.

5. Click the **Lights** sheet.

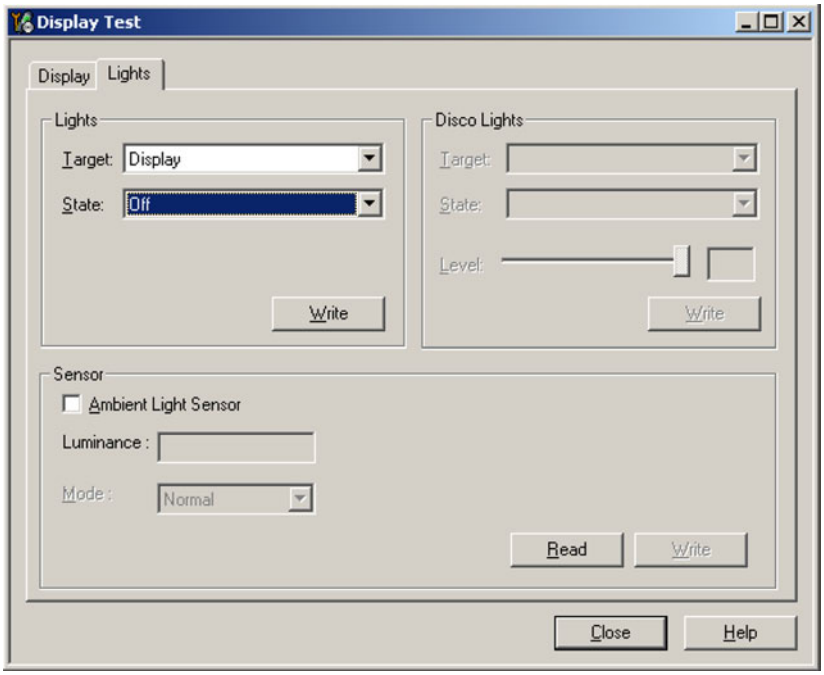


6. From **Target** partition, select **Display**.
7. From **State** partition, select **On**.
8. Click **Write**.
9. Click **Close** to end the lights testing.

Switching display lighting OFF using Phoenix

Prerequisites

First, go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49), if not done yet.



Copyright © 2008 Nokia. All rights reserved.

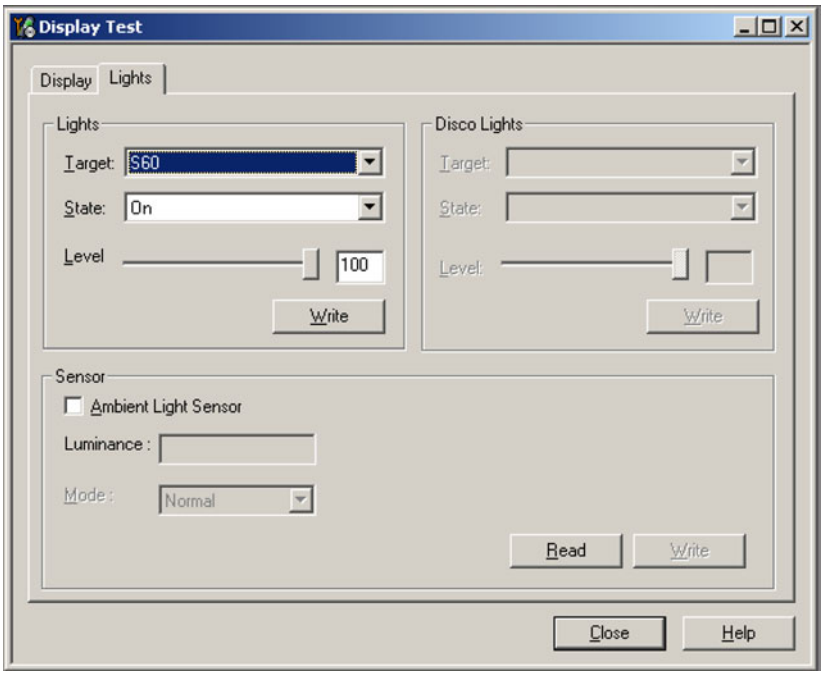
Steps

1. From **Target** partition, select **Display**.
2. From **State** partition, select **Off**.
3. Click **Write**.
4. Click **Close** to end the lights testing.

Switching S60 keyboard lighting ON using Phoenix

Prerequisites

First, go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49), if not done yet.



Steps

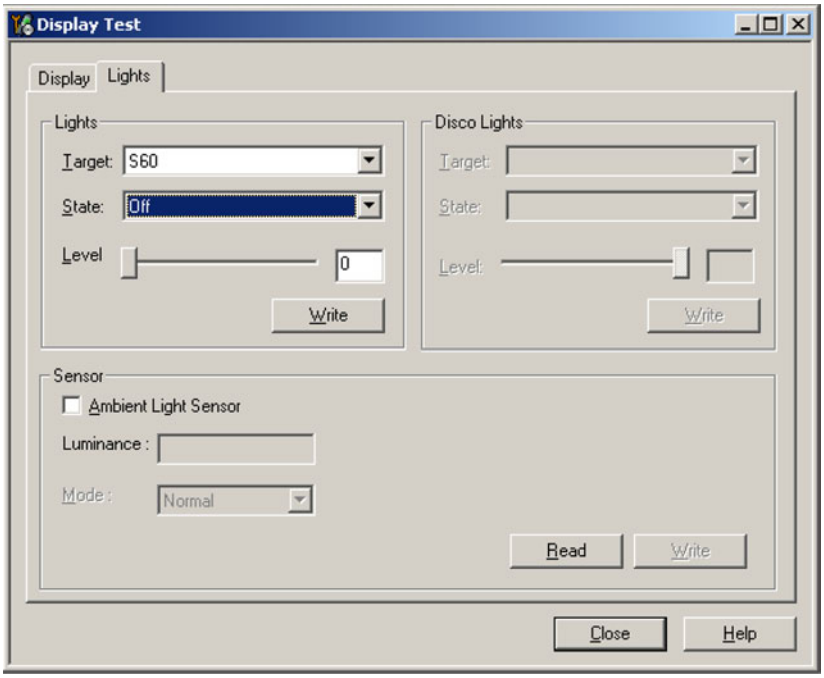
1. From **Target** partition, select **S60**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching S60 keyboard lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.

Copyright © 2008 Nokia. All rights reserved.



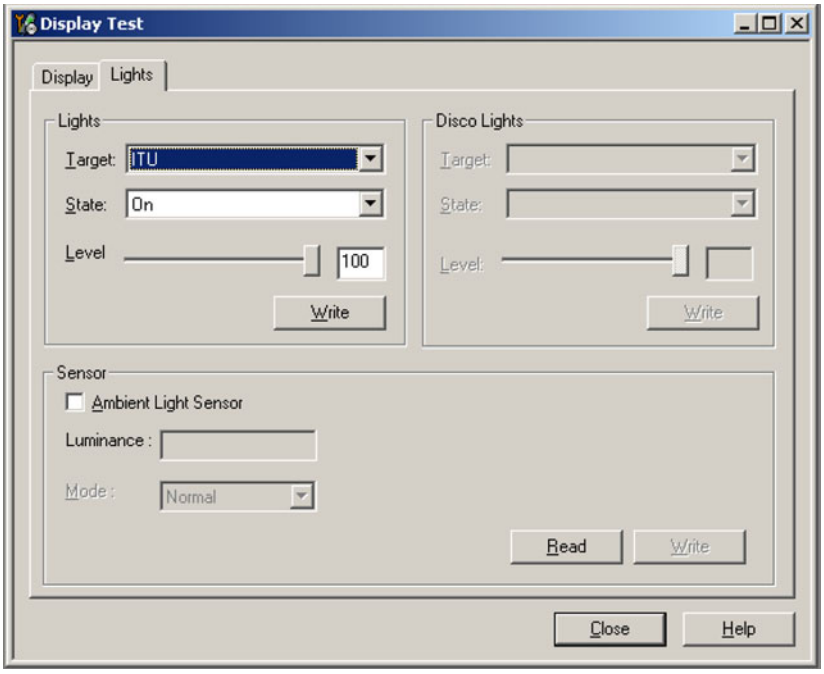
Steps

1. From **Target** partition, select **S60**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Switching ITU (numeric) keyboard lighting ON using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Copyright © 2008 Nokia. All rights reserved.

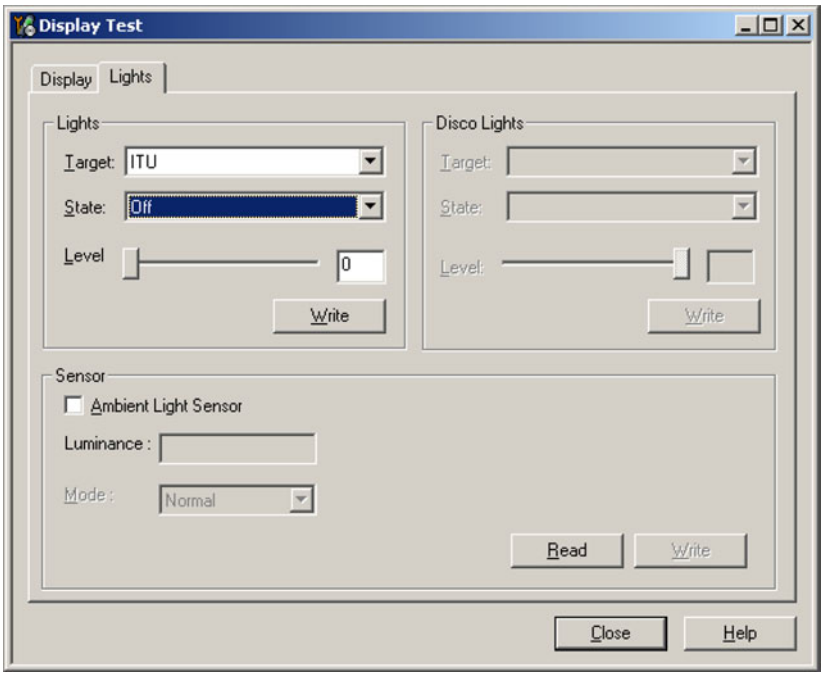
Steps

1. From **Target** partition, select **ITU**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching ITU (numeric) keyboard lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Steps

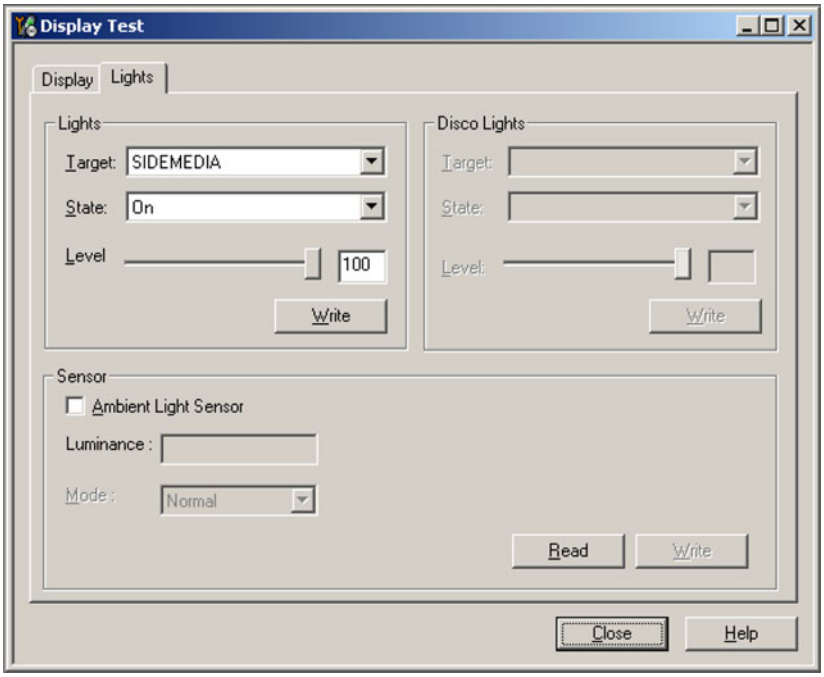
1. From **Target** partition, select **ITU**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Switching sidemedia keys lighting ON using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.

Copyright © 2008 Nokia. All rights reserved.



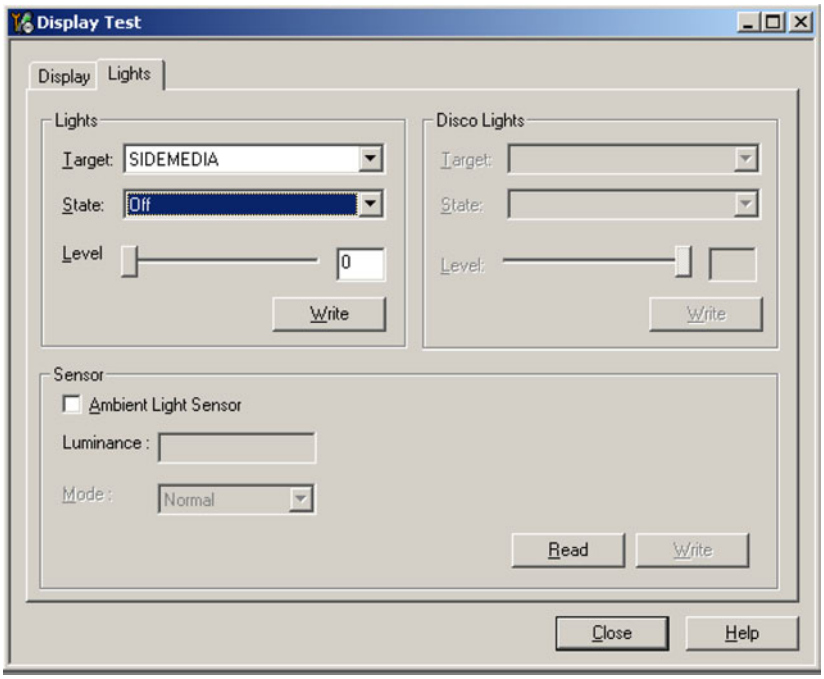
Steps

1. From **Target** partition, select **SIDEMEDIA**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching sidemedia keys lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Copyright © 2008 Nokia. All rights reserved.

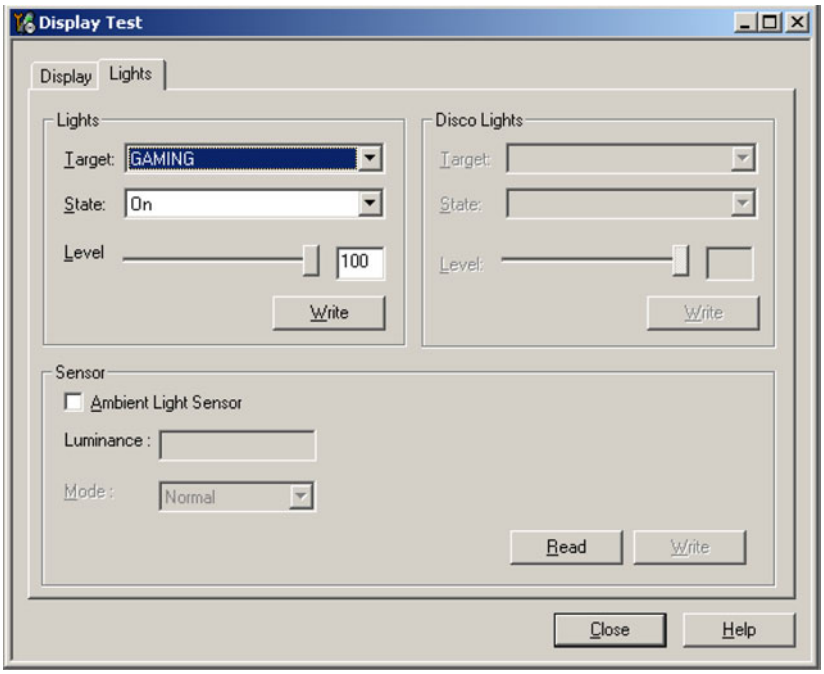
Steps

1. From **Target** partition, select **SIDEMEDIA**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Switching gaming keys lighting ON using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Steps

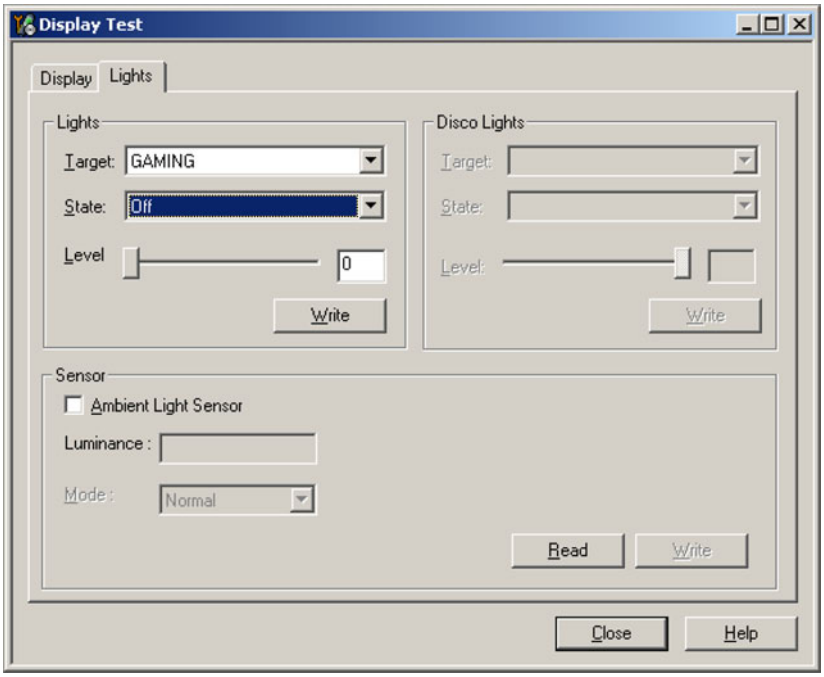
1. From **Target** partition, select **GAMING**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching gaming keys lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.

Copyright © 2008 Nokia. All rights reserved.



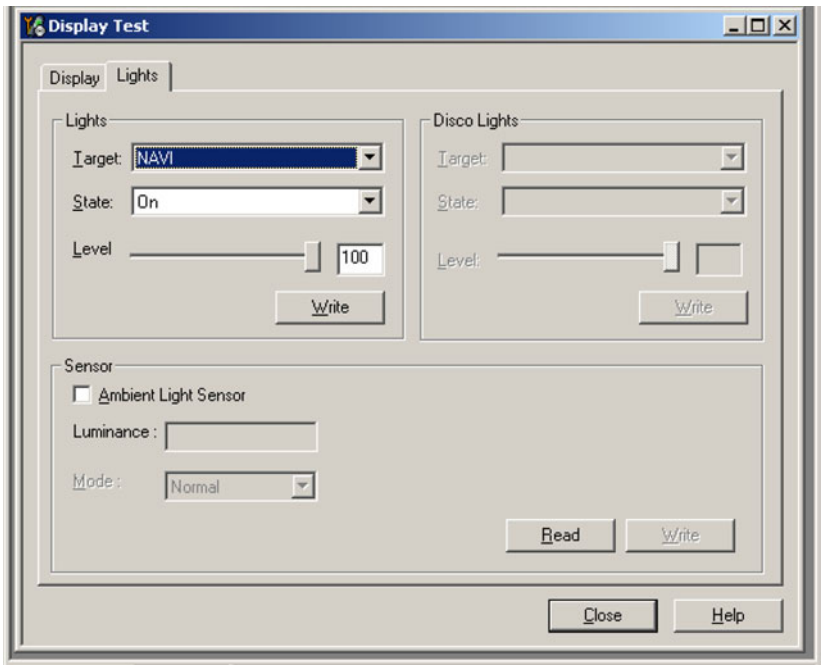
Steps

1. From **Target** partition, select **GAMING**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Switching Navi key lighting ON using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Copyright © 2008 Nokia. All rights reserved.

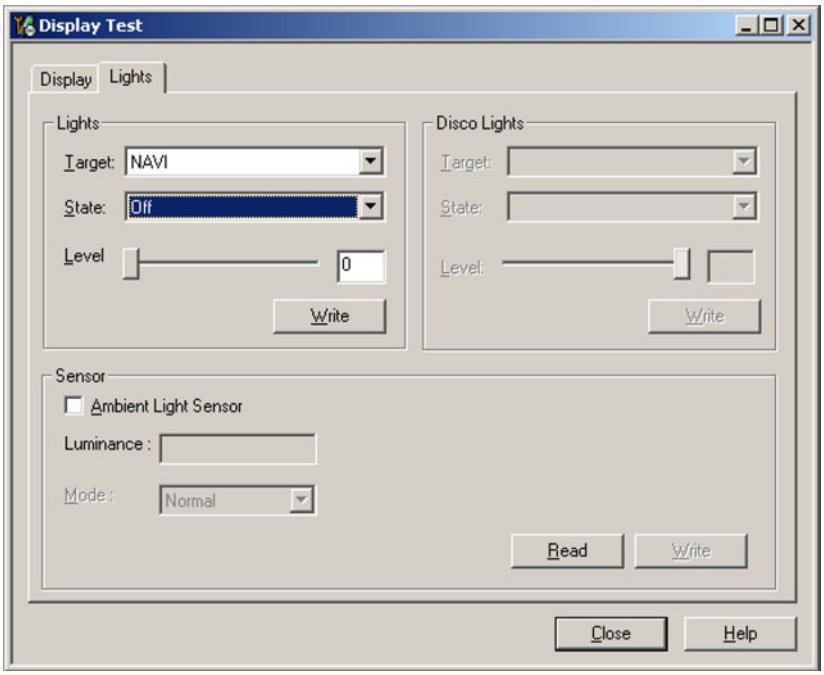
Steps

1. From **Target** partition, select **NAVI**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching Navi key lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Steps

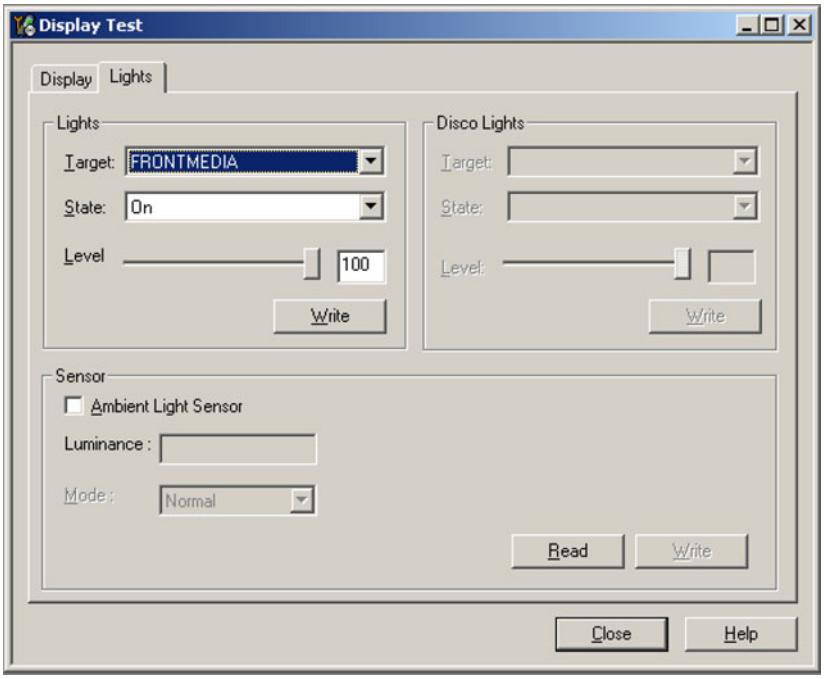
1. From **Target** partition, select **NAVI**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Switching frontmedia key lighting ON using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.

Copyright © 2008 Nokia. All rights reserved.



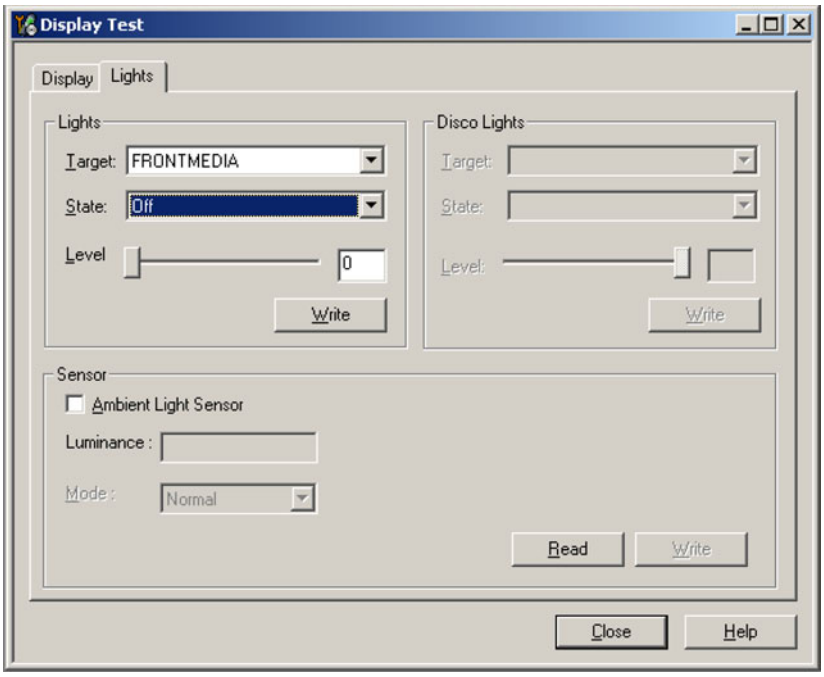
Steps

1. From **Target** partition, select **FRONTMEDIA**.
2. From **State** partition, select **On**.
3. Set **Level** to **100** and click **Write**.
4. Click **Close** to end the lights testing.

Switching frontmedia key lighting OFF using Phoenix

Prerequisites

First go through steps 1-5 in Switching display lighting ON using Phoenix (page 3–49) if not done yet.



Copyright © 2008 Nokia. All rights reserved.

Steps

1. From **Target** partition, select **FRONTMEDIA**.
2. From **State** partition, select **Off**.
3. Set **Level** to **0** and click **Write**.
4. Click **Close** to end the lights testing.

Bluetooth troubleshooting

Introduction to Bluetooth troubleshooting

There are two main Bluetooth problems that can occur:

Problem	Description
Damage to BT antenna	This would most likely happen if the device has been dropped repeatedly to the ground. It could damage the BT antenna (which is on the battery cover), or solder joint (see next page for details about BT antenna and Mechanics).
A malfunction in the BT ASIC, BB ASICs or Phone's BT SMD components.	This is unpredictable and could have many causes i.e. SW or HW related.

The main issue is to find out if the problem is related to the BT antenna or related to the BT system or the phone's BB and then replace/fix the faulty component.

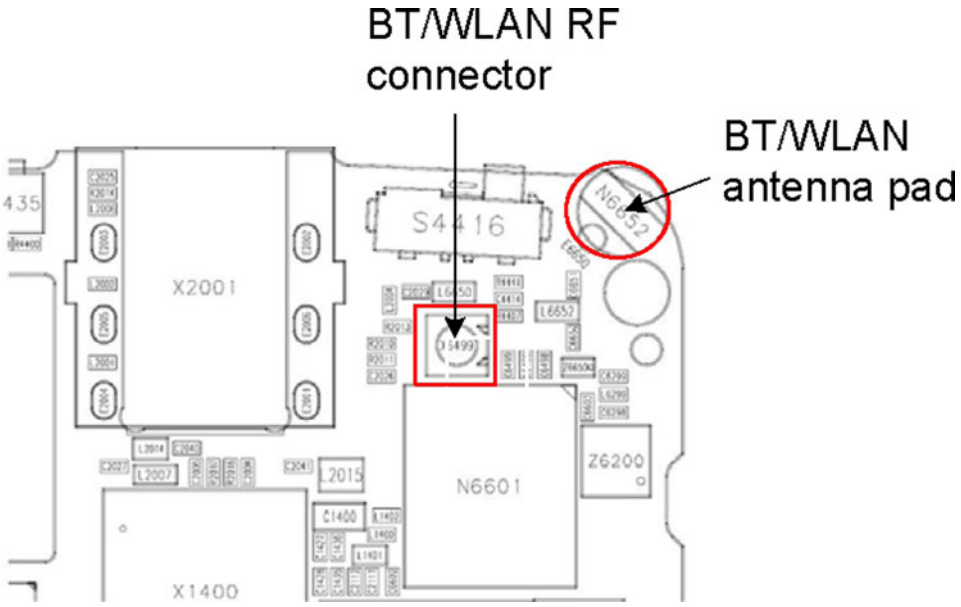


Figure 25 Bluetooth placement on the bottom side

Copyright © 2008 Nokia. All rights reserved.

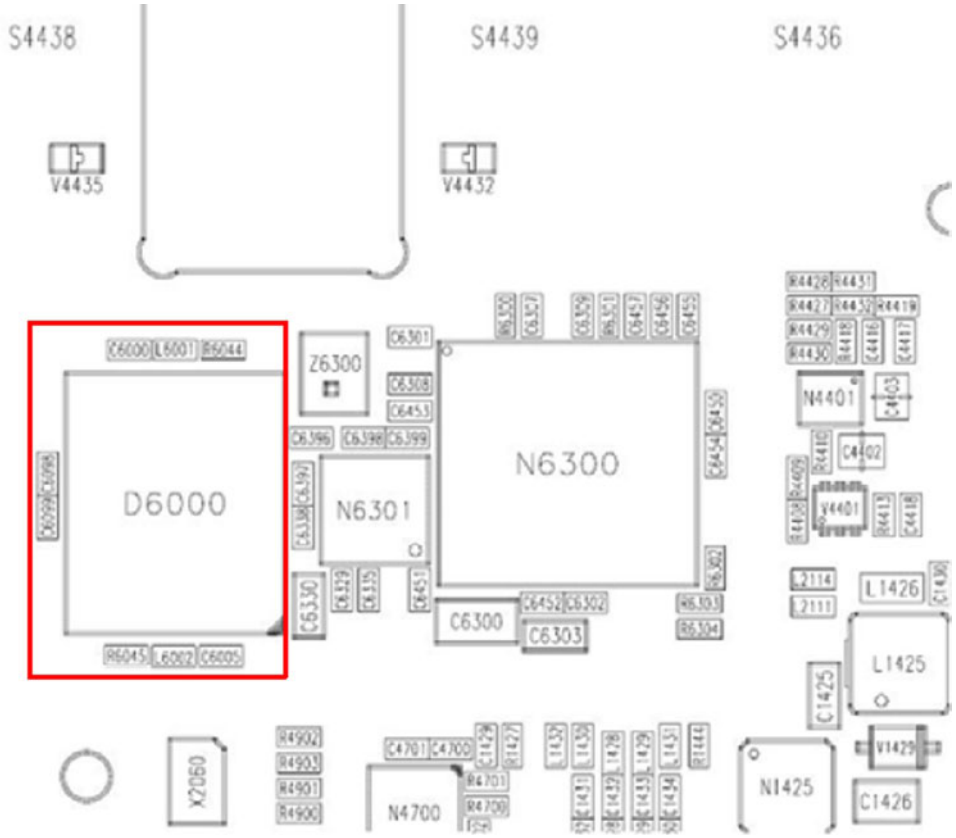


Figure 26 Bluetooth placement on the top side

Bluetooth settings for Phoenix

Steps

1. Start *Phoenix* service software.
2. From the **File** menu, choose **Open Product**, and then choose the correct type designator from the **Product** list.
3. Place the phone to a flash adapter in the local mode.
4. Choose **Testing→Bluetooth LOCALS** .
5. Locate JBT-9's serial number (12 digits) found in the type label on the back of JBT-9.

   In addition to JBT-9, also SB-6, JBT-3 and JBT-6 Bluetooth test boxes can be used.
6. In the *Bluetooth LOCALS* window, write the 12-digit serial number on the **Counterpart BT Device Address** line.

   This needs to be done only once provided that JBT-9 is not changed.
7. Place the JBT-9 box near (within 10 cm) the BT antenna and click **Run BER Test**.

Results

Bit Error Rate test result is displayed in the *Bit Error Rate (BER) Tests* pane in the *Bluetooth LOCALS* window.

Copyright © 2008 Nokia. All rights reserved.

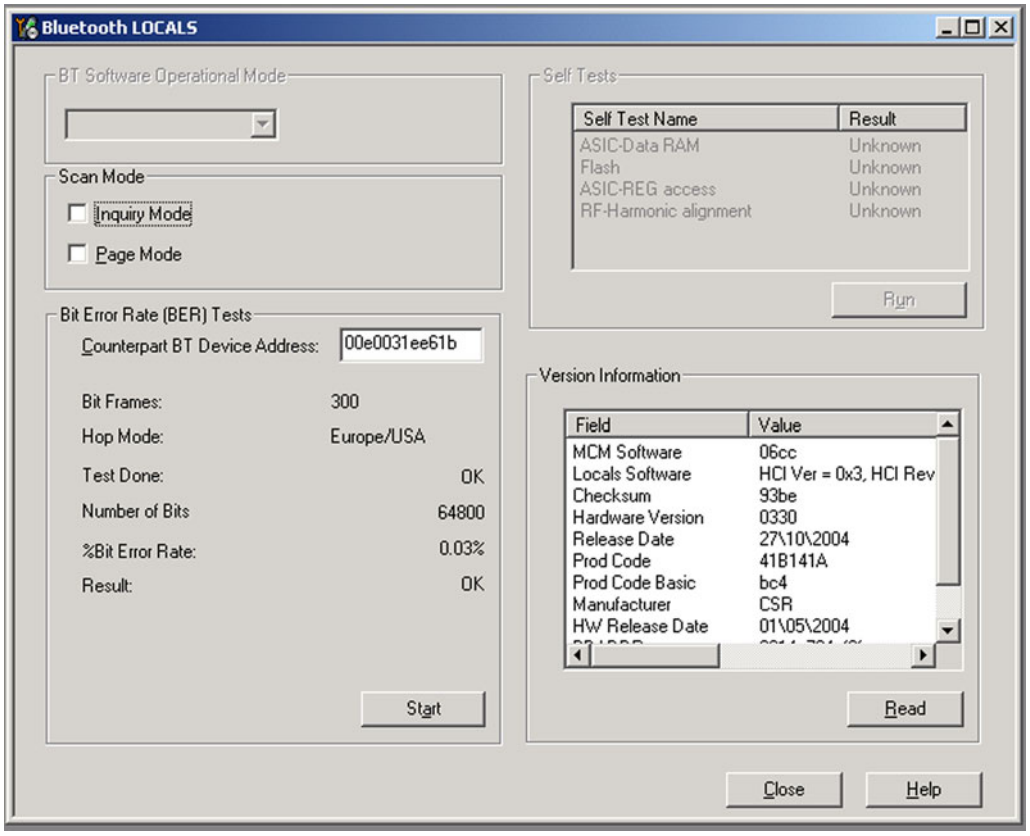


Figure 27 BER test result

Bluetooth self tests in Phoenix

Steps

1. Start *Phoenix* service software.
2. Choose**File→Scan Product.**
3. Place the phone to a flash adapter.
4. From the **Mode** drop-down menu, set mode to **Local**.
5. Choose **Testing→Self Tests.**
6. In the *Self Tests* window check the following Bluetooth related tests:
   - **ST_LPRF_IF_TEST**
   - **ST_LPRF_AUDIO_LINES_TEST**
   - **ST_BT_WAKEUP_TEST**

Copyright © 2008 Nokia. All rights reserved.

7. To run the tests, click **Start**.

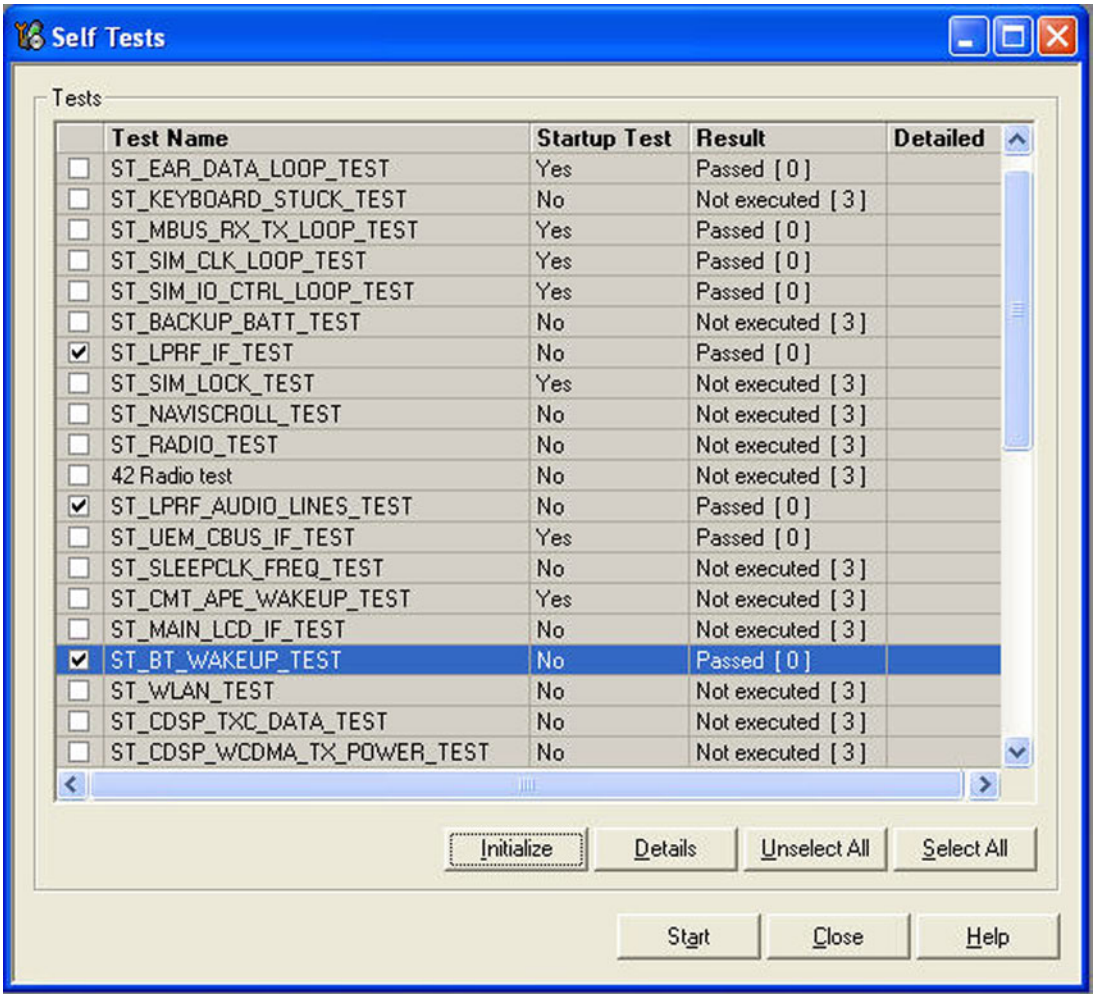
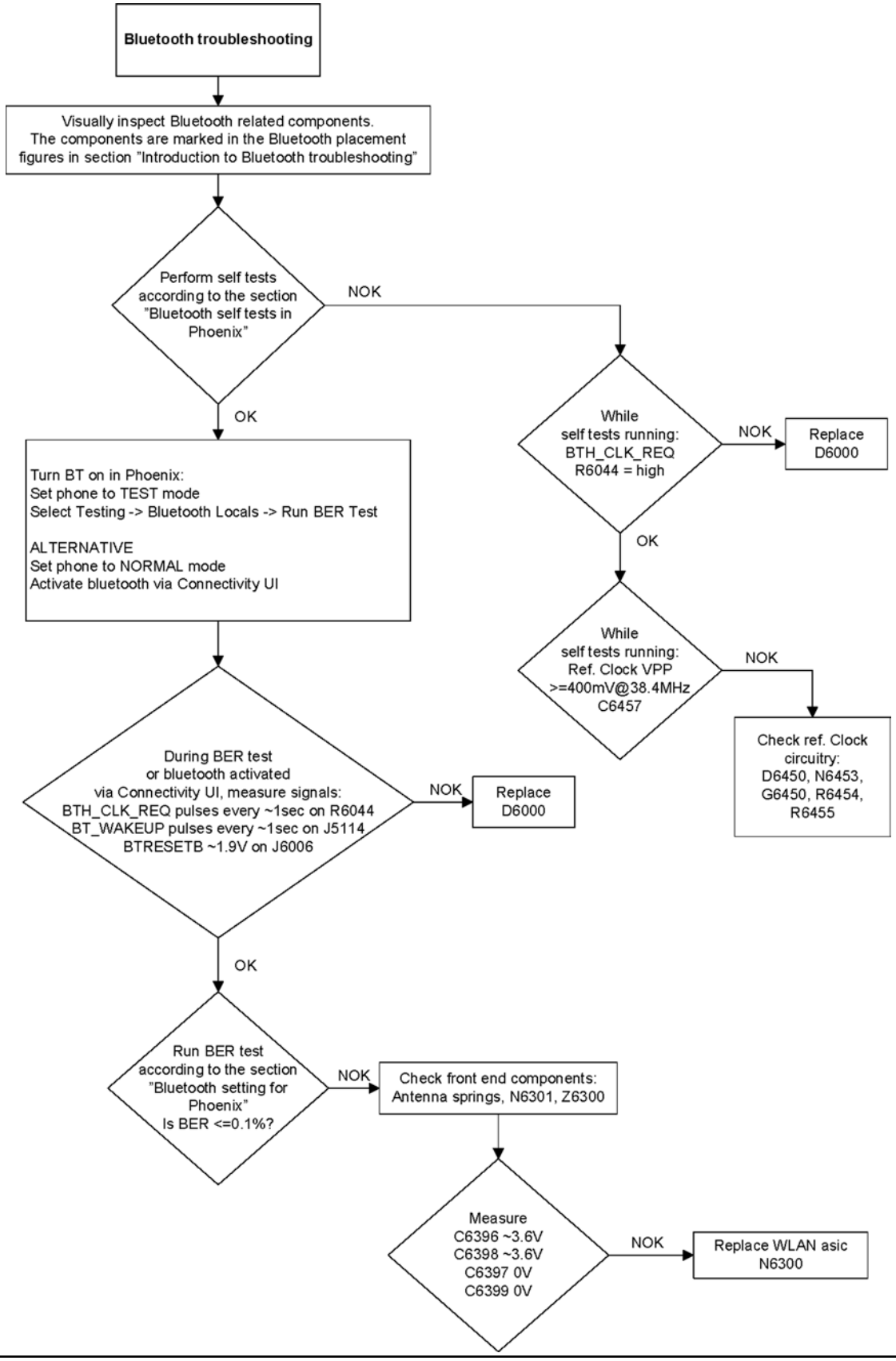


Figure 28 Bluetooth self tests in *Phoenix*

Copyright © 2008 Nokia. All rights reserved.

Bluetooth troubleshooting

Troubleshooting flow


Bluetooth troubleshooting
Visually inspect Bluetooth related components. The components are marked in the Bluetooth placement figures in section "Introduction to Bluetooth troubleshooting"
Perform self tests according to the section "Bluetooth self tests in Phoenix"
NOK
OK
While self tests running: BTH_CLK_REQ R6044 = high
NOK
Replace D6000
OK
Turn BT on in Phoenix:
Set phone to TEST mode
Select Testing -> Bluetooth Locals -> Run BER Test
ALTERNATIVE
Set phone to NORMAL mode
Activate bluetooth via Connectivity UI
While self tests running: Ref. Clock VPP >=400mV@38.4MHz C6457
NOK
Check ref. Clock circuitry: D6450, N6453, G6450, R6454, R6455
During BER test or bluetooth activated via Connectivity UI, measure signals:
BTH_CLK_REQ pulses every ~1sec on R6044
BT_WAKEUP pulses every ~1sec on J5114
BTRESETB ~1.9V on J6006
NOK
Replace D6000
OK
Run BER test according to the section "Bluetooth setting for Phoenix"
Is BER <=0.1%?
NOK
Check front end components: Antenna springs, N6301, Z6300
Measure
C6396 ~3.6V
C6398 ~3.6V
C6397 0V
C6399 0V
NOK
Replace WLAN asic N6300

Copyright © 2008 Nokia. All rights reserved.

Audio troubleshooting

Audio paths

The earpiece is driven directly by a built-in linear power amplifier included in the EM ASIC N2200 ASIC. The output has a differential output configuration. Signal lines are biased by the EM ASIC N2200.

The vibra is driven directly by a built-in digital pulse modulated amplifier included in the EM ASIC N2200 ASIC. The output has a differential output configuration.

Nokia AV stereo output is driven by a discrete stereo headphone amplifier that is connected to the balanced outputs of the EM ASIC N2100 ASIC. The discrete stereo headphone output has a single-ended ground reference output.

Stereo speakers are driven by a discrete digital stereo speaker amplifier that is connected to the balanced outputs of the EM ASIC N2200. The discrete stereo speaker amplifier has a differential output configuration.

The internal microphone is connected directly to the single-ended input of the EM ASIC N2200. Signal line is biased by the EM ASIC N2200.

Nokia AV mono input is connected to the EM ASIC N2200 single-ended input via two switches: data-switch and video-switch. The input is biased by the EM ASIC N2200.

Audio loop test

Audio paths can be tested via a built-in audio loop test routine. To test a specific audio path, an electrical test signal can be fed into the mono input of the Nokia AV-connector and looped to specified audio output: earpiece, stereo speakers or the Nokia AV stereo output. Similarly, an acoustical or an electrical test signal can be fed into the internal microphone and looped to the Nokia AV stereo output. Loop routines can be initiated using the audio test interface in the Phoenix service program.

Vibra can be tested by dedicated vibra test in the Phoenix service program.

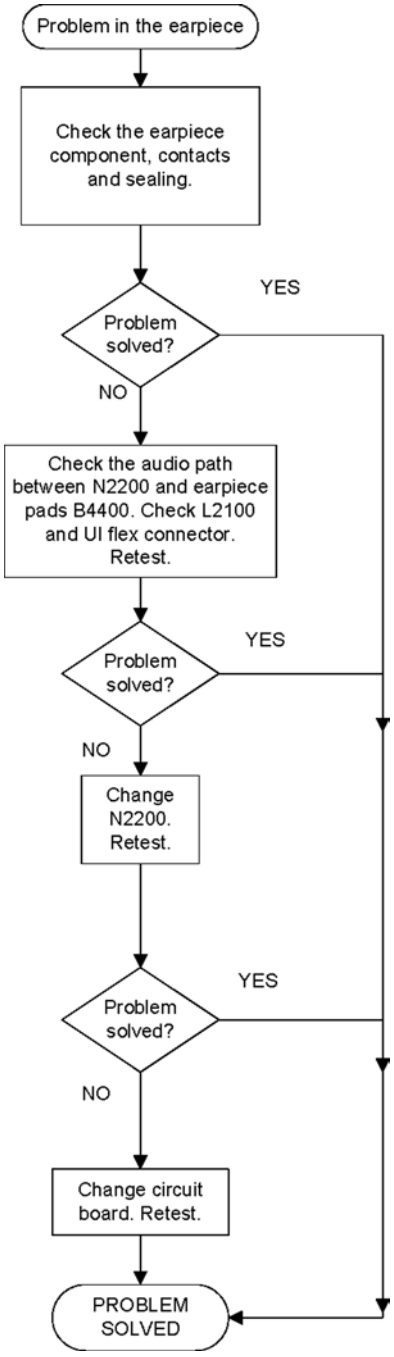
Table 11 Audio loop test reference results

Audio loop	Input terminal	Output terminal	Frequency	Input signal	Output signal
XMIC to EAR	AV connector	Internal earpiece	1kHz	0.1 [V]	y [V]
XMIC to IHF	AV connector	Stereo speakers	2kHz	0.1 [V]	y [A]
XMIC to XEAR	AV connector	AV connector	1kHz	0.1 [V]	y [V]
INTMIC to XEAR	Internal microphone	AV connector	1kHz	0.01 [V]	y [V]

Copyright © 2008 Nokia. All rights reserved.

Internal earpiece troubleshooting

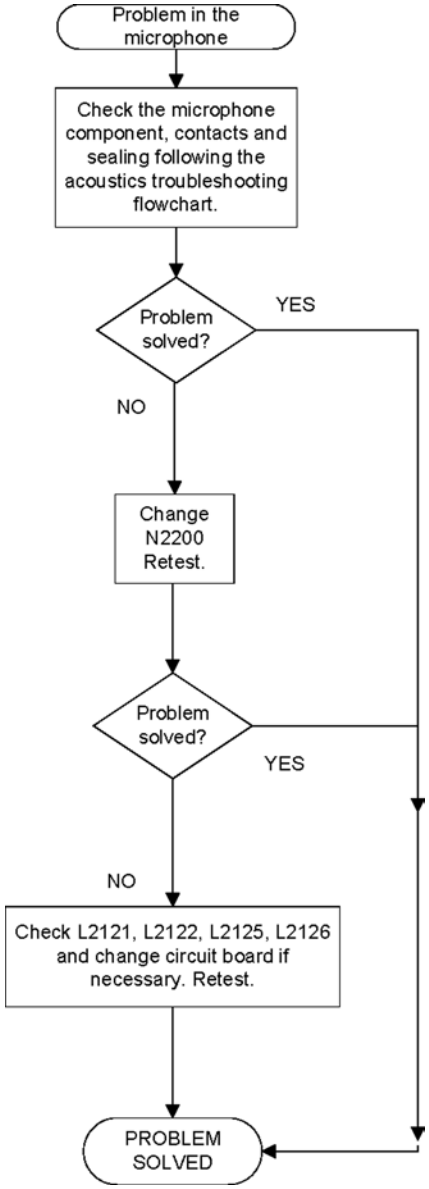
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Internal microphone troubleshooting

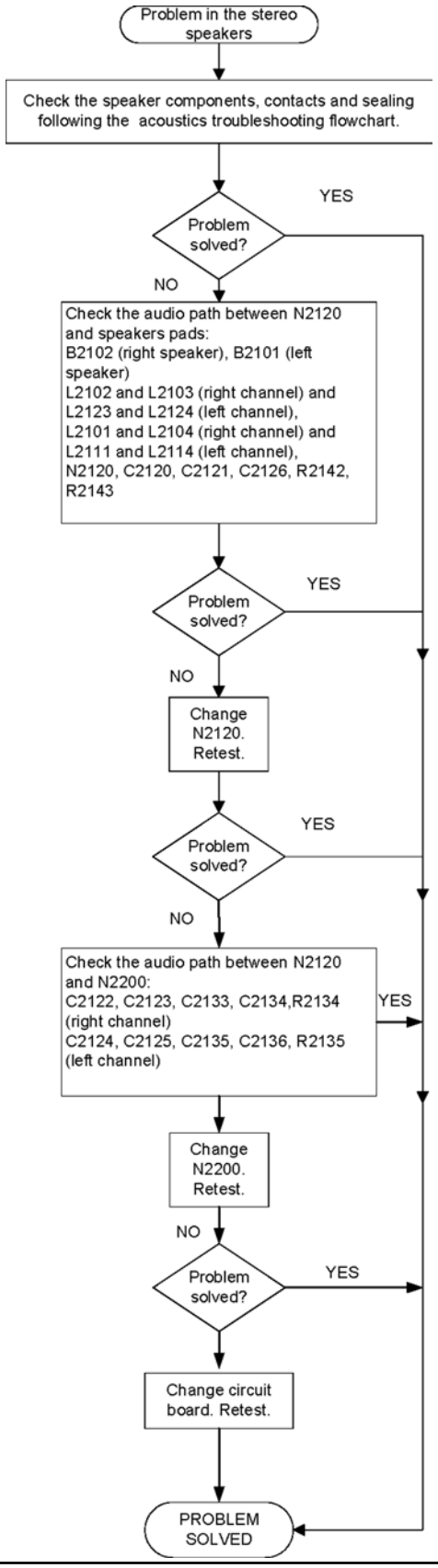
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Stereo speakers troubleshooting

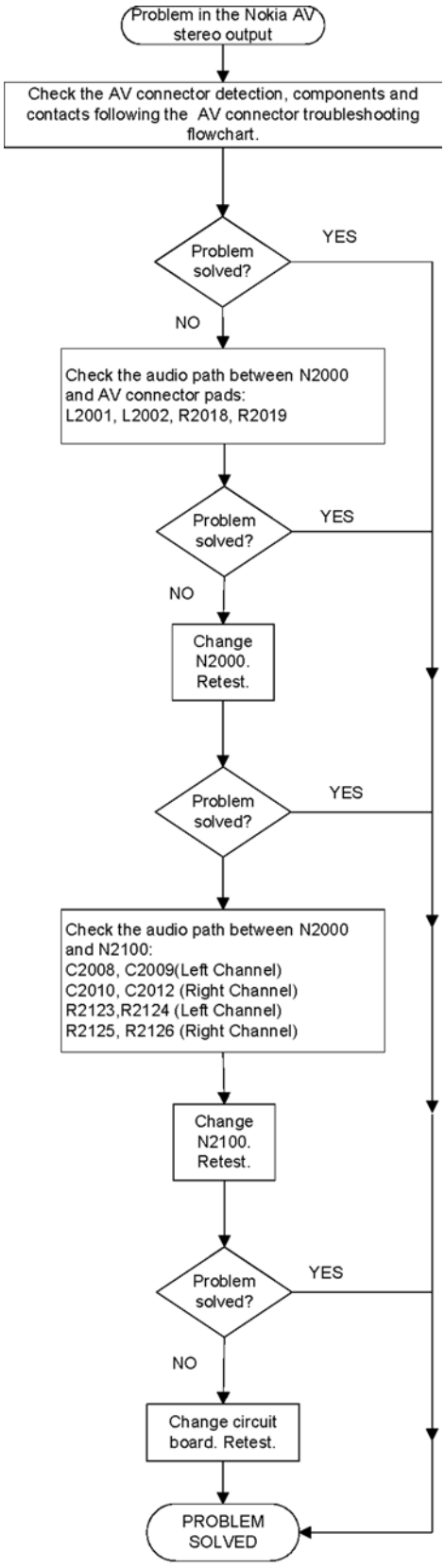
Troubleshooting flow


Problem in the stereo speakers
Check the speaker components, contacts and sealing following the acoustics troubleshooting flowchart.
Problem solved?
YES
NO
Check the audio path between N2120 and speakers pads:
B2102 (right speaker), B2101 (left speaker)
L2102 and L2103 (right channel) and L2123 and L2124 (left channel),
L2101 and L2104 (right channel) and L2111 and L2114 (left channel),
N2120, C2120, C2121, C2126, R2142, R2143
Problem solved?
YES
NO
Change N2120. Retest.
Problem solved?
YES
NO
Check the audio path between N2120 and N2200:
C2122, C2123, C2133, C2134,R2134 (right channel)
C2124, C2125, C2135, C2136, R2135 (left channel)
YES
Change N2200. Retest.
NO
Problem solved?
YES
Change circuit board. Retest.
PROBLEM SOLVED

Copyright © 2008 Nokia. All rights reserved.

AV stereo output troubleshooting

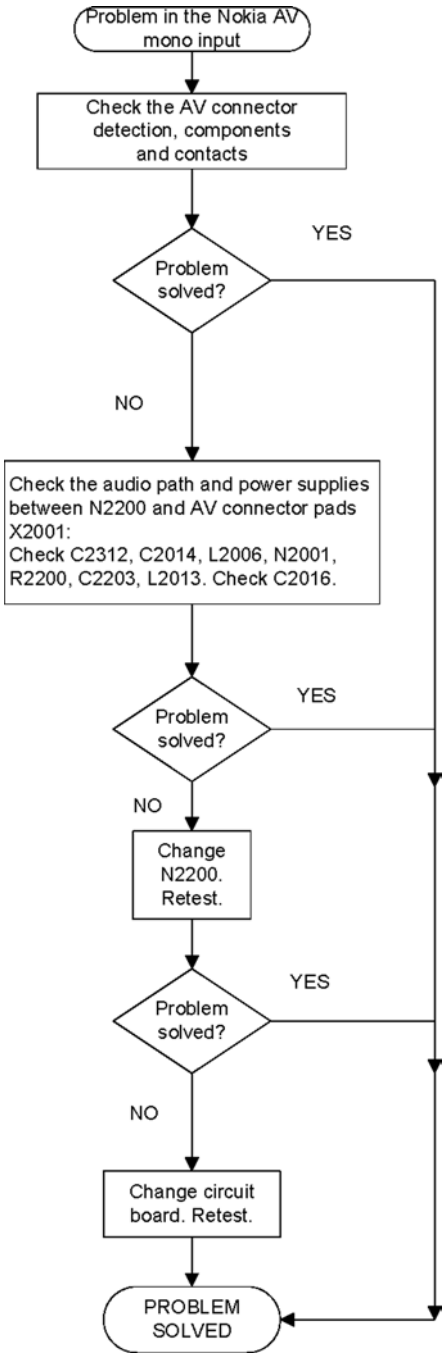
Troubleshooting flow


Problem in the Nokia AV stereo output
Check the AV connector detection, components and contacts following the AV connector troubleshooting flowchart.
Problem solved?
YES
NO
Check the audio path between N2000 and AV connector pads: L2001, L2002, R2018, R2019
Problem solved?
YES
NO
Change N2000. Retest.
Problem solved?
YES
Check the audio path between N2000 and N2100: C2008, C2009(Left Channel) C2010, C2012 (Right Channel) R2123,R2124 (Left Channel) R2125, R2126 (Right Channel)
Change N2100. Retest.
Problem solved?
YES
NO
Change circuit board. Retest.
PROBLEM SOLVED

Copyright © 2008 Nokia. All rights reserved.

AV mono input troubleshooting

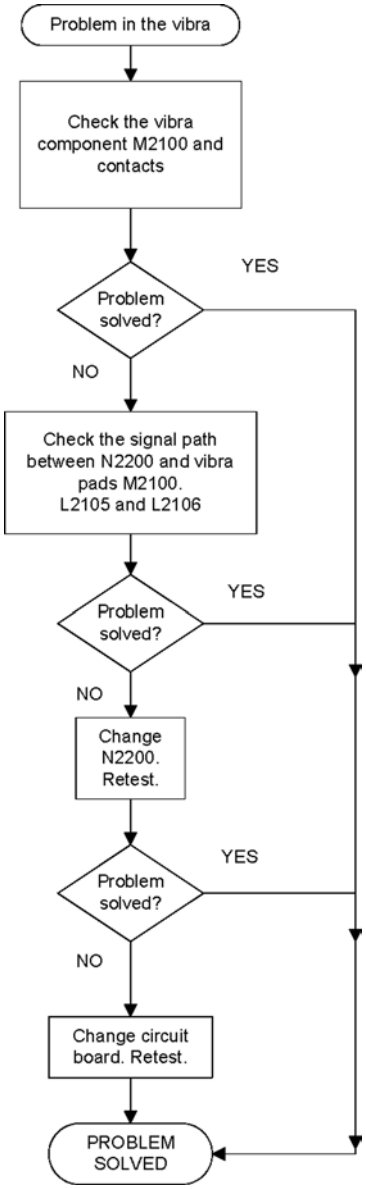
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Vibra troubleshooting

Troubleshooting flow



Baseband manual tuning guide

Energy management calibration

Prerequisites

Energy Management (EM) calibration is performed to calibrate the setting (gain and offset) of AD converters in several channels (that is, **battery voltage**, **BSI**, **battery current**) to get an accurate AD conversion result.

Hardware setup:

- An external power supply is needed.
- Supply 12V DC from an external power supply to CU-4 to power up the phone.
- The phone must be connected to a CU-4 control unit with a product-specific flash adapter.

Copyright © 2008 Nokia. All rights reserved.

Steps

1. Place the phone to the docking station adapter (CU-4 is connected to the adapter).
2. Start *Phoenix* service software.
3. Choose **File→ Scan Product.**
4. Choose **Tuning→Energy Management Calibration.**
5. To show the current values in the phone memory, click **Read**, and check that communication between the phone and CU-4 works.
6. Check that the **CU-4 used** check box is checked.
7. Select the item(s) to be calibrated.

   Note: ADC calibration has to be performed before other item(s). However, if all calibrations are selected at the same time, there is no need to perform the ADC calibration first.
8. Click **Calibrate**.

   The calibration of the selected item(s) is carried out automatically.

   The candidates for the new calibration values are shown in the *Calculated values* column. If the new calibration values seem to be acceptable (please refer to the following "Calibration value limits" table), click **Write** to store the new calibration values to the phone permanent memory.

Table 12 Calibration value limits

Parameter	Min.	Max.
ADC Gain	13000	13350
ADC Offset	-14	14
BSI Gain	1100	1300
VBAT_SCAL Gain	21000	21900
VBAT_SCAL Offset	2450	2570
IBAT Gain	7750	12250

9. Click **Read**, and confirm that the new calibration values are stored in the phone memory correctly. If the values are not stored to the phone memory, click **Write** and/or repeat the procedure again.
10. To end the procedure, close the *Energy Management Calibration* window.

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

4 — RF troubleshooting

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

General RF troubleshooting 4–5
Introduction to RF troubleshooting 4–5
RF key components 4–6
Auto tuning for BB5.0 4–7
WLAN autotuning 4–7
General chekings 4–8
Antenna line component checking 4–8
Voltage checking 4–8
Self test troubleshooting 4–11
Receiver troubleshooting 4–12
Introduction to receiver (RX) troubleshooting 4–12
GSM RX chain activation for manual measurements/GSM RSSI measurement 4–12
WCDMA RX chain activation for manual measurement/WCDMA RSSI measurement 4–13
Transmitter troubleshooting 4–14
General instructions for transmitter (TX) troubleshooting 4–14
GSM transmitter troubleshooting 4–14
GSM transmitter troubleshooting flowchart 4–17
WCDMA transmitter troubleshooting 4–17
WCDMA transmitter troubleshooting flowchart 4–19
WLAN RF troubleshooting 4–19
Introduction to WLAN RF troubleshooting 4–19
General WLAN RF troubleshooting 4–20
Radiated testing with battery cover 4–20
Conducted testing with MJ-131 module jig 4–21
Conducted WLAN troubleshooting 4–23
WLAN front-end test 4–23
WLAN front-end troubleshooting 4–25
WLAN ASIC test 4–25
WLAN ASIC troubleshooting 4–28
WLAN Tx power autotuning 4–28

List of Figures

Figure 29 Auto tuning concept with CMU200 4–7
Figure 30 WLAN autotune test equipment setup 4–8
Figure 31 Tx Control window 4–9
Figure 32 General voltage checking test points 4–10
Figure 33 RF control window 4–15
Figure 34 Typical readings 4–16
Figure 35 Test equipment setup 4–21
Figure 36 Test equipment setup for conductive test 4–22
Figure 37 Test points around the WLAN ASIC 4–26
Figure 38 Test point around the clock buffer circuit 4–27

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

General RF troubleshooting

Introduction to RF troubleshooting

Most RF semiconductors are static discharge sensitive

ESD protection must be applied during repair (ground straps and ESD soldering irons).

Pre-baking

These parts are moisture sensitive and must be pre-baked prior to soldering:

- RFIC N7505
- Front End Module (FEM) N7520
- WCDMA PA N7540

Discrete components

In addition to the key-components, there are a number of discrete components (resistors, inductors and capacitors) for which troubleshooting is done mainly by *visual inspection*.

Capacitors: check for short circuits.

Resistors: check value with an ohm meter.

Note: In-circuit measurements should be evaluated carefully

Measuring equipment

All measurements should be done using:

- An oscilloscope for low frequency and DC measurements. Recommended probe: 10:1, 10Mohm//8pF.
- A radio communication tester including RF generator and spectrum analyser, for example Rohde & Schwarz CMU200. (Alternatively a spectrum analyser and an RF generator can be used. Some tests in this guide are not possible to perform if this solution is chosen).

  Note: A mobile phone WCDMA transmitter should never be tested with full TX power (only it possible to perform the measurements in a good RF-shielded room). Even low power WCDMA transmitters may disturb nearby WCDMA networks and cause problems to 3G cellular phone communication in a wide area.

  Note: All measurements with an RF coupler should be performed in an RF-shielded environment because nearby base stations can disturb sensitive receiver measurements. If there is no possibility to use RF shielded environment, testing at frequencies of nearby base stations should be avoided.

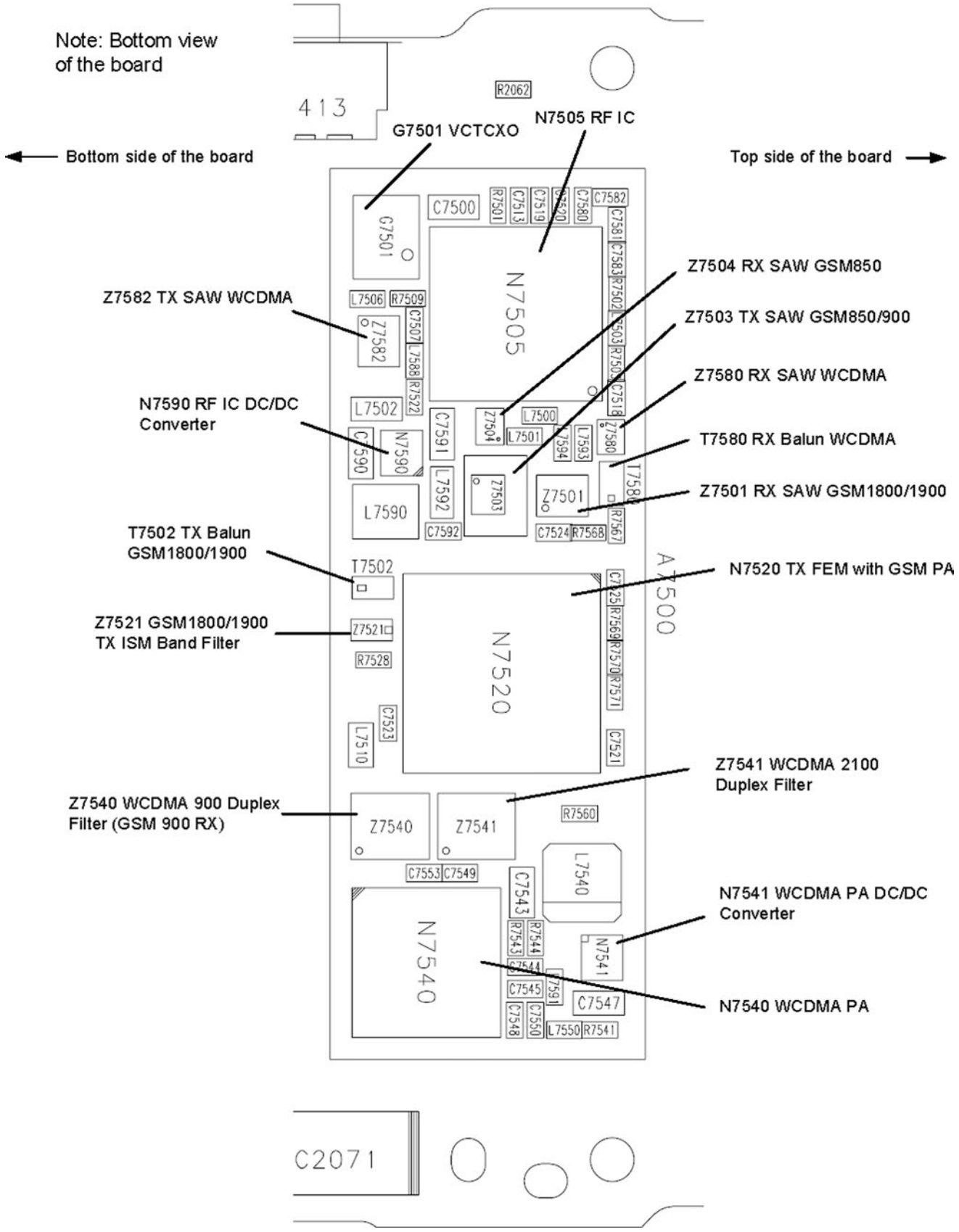
Level of repair

The scope of this guideline is to enable repairs at key-component level. Some key-components are not accessible, i.e. not replaceable. Please refer to the list of *Non replaceable RF components*.

Note: If the RF shieldning can is removed (for measurement or repair), it must always be replaced with a new one.

Copyright © 2008 Nokia. All rights reserved.

RF key components


Note: Bottom view of the board
G7501 VCTCXO
N7505 RF IC
Bottom side of the board
Top side of the board
Z7582 TX SAW WCDMA
Z7504 RX SAW GSM850
Z7503 TX SAW GSM850/900
Z7580 RX SAW WCDMA
N7590 RF IC DC/DC Converter
T7580 RX Balun WCDMA
Z7501 RX SAW GSM1800/1900
T7502 TX Balun GSM1800/1900
N7520 TX FEM with GSM PA
Z7521 GSM1800/1900 TX ISM Band Filter
Z7541 WCDMA 2100 Duplex Filter
Z7540 WCDMA 900 Duplex Filter (GSM 900 RX)
N7541 WCDMA PA DC/DC Converter
N7540 WCDMA PA

Copyright © 2008 Nokia. All rights reserved.

Auto tuning for BB5.0

This phone can be tuned automatically.

Autotune is designed to align the phone's RF part easier and faster. It performs calibrations, tunings and measurements of RX and TX. The results are displayed and logged in a result file, if initiated.

Hardware set up

Hardware requirements for auto tuning:

- PC (Windows 2000/XP) with GPIB card
- Power supply
- Product specific module jig
- Cables: XRF-1 (RF cable), USB cable, GPIB cable and DAU-9S
- Signal analyser (TX), signal generator (RX) and RF-splitter *or* one device including all.

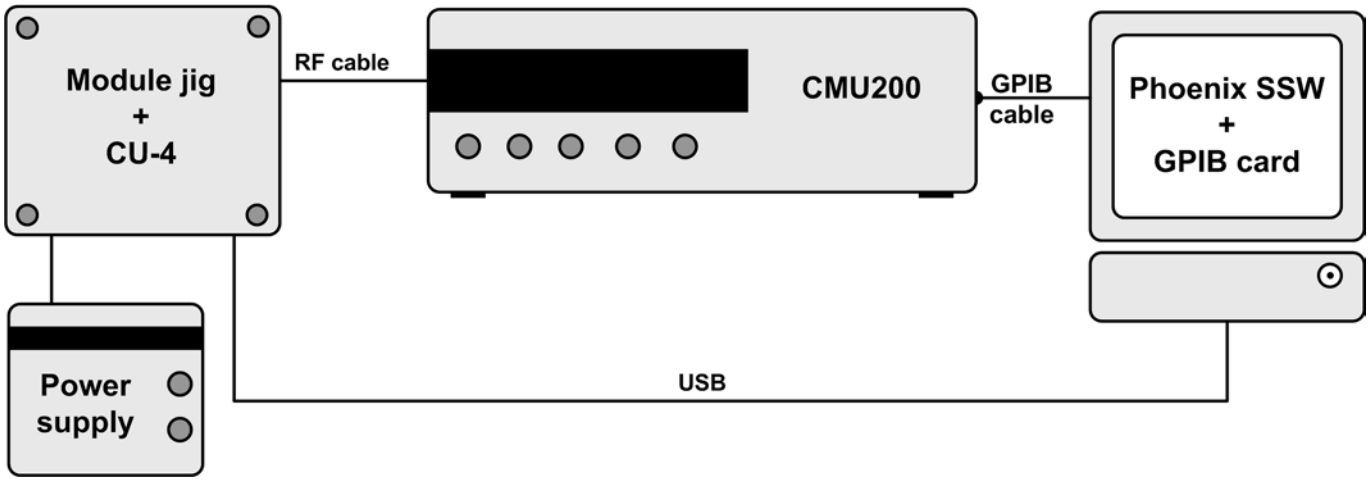


Figure 29 Auto tuning concept with CMU200

Note: Crossover Cable connection between computer and CU200 is recommended (refer to Service Devices chapter and Module Jig concept).

Phoenix preparations

Install the phone specific data package, for example *RM-247_dp_1.78_sw_sh3.26.exe*. This defines phone specific settings.

Auto tuning procedure

1 Make sure the phone (in the jig) is connected to the equipment. Else, some menus will not be shown in Phoenix.

2 To go to autotune, select *Tuning (Alt-U)* > *Auto-Tune (Alt-A)* from the menu.

3 Start autotuning, clicking the *Tune* button.

WLAN autotuning

WLAN autotuning is usually performed when either the WLAN ASIC (N6300) or the front-end module (N6301) is replaced, and the WLAN TX power level needs to be re-calibrated. In a case when the WLAN tuning values in the phone's memory have been erased for some reason, the tuning is also needed. The results are displayed on the PC's monitor, and logged in a result file if initiated.

Copyright © 2008 Nokia. All rights reserved.

Hardware setup

Hardware requirements for autotuning:

- PC (Windows 2000/XP) with GPIB card
- Power supply
- Product specific module jig
- Cables: XRF-1 (RF cable), USB cable, GPIB cable and DAU-9S

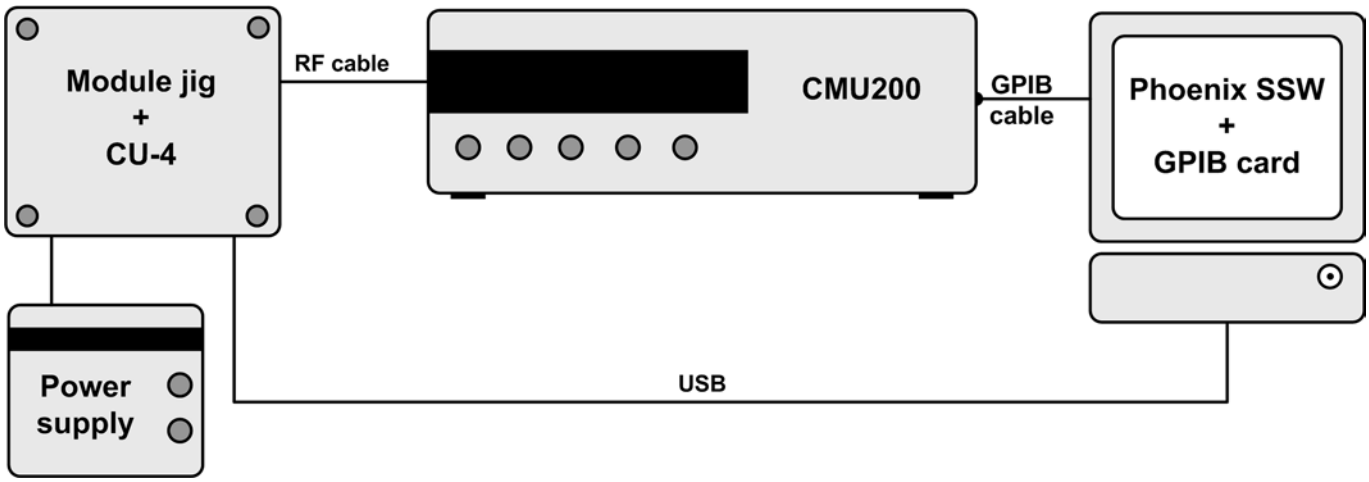


Figure 30 WLAN autotune test equipment setup

Phoenix requirements

Install the phone's specific data package. This defines the phone's own product settings.

Autotuning procedure

1 Set up the test equipment as shown in the figure above. Make sure the phone (in the jig) is connected to the equipment, otherwise some menus will not be shown in Phoenix.

2 Connect the CMU200's input port to the WLAN RF connector (X6499) on the phone PWB, with an RF adaptor connector.

3 In Phoenix, select **Tuning > WLAN Auto-Tune** from the drop-down menu.

4 Start WLAN autotuning by clicking the **Tune** button. It takes a couple of minutes to complete the tuning.

General chekings

Antenna line component checking

Check R7560 (0ohm resistor).

Voltage checking

Steps

1. Set up the main board in the module jig. The phone should be in local mode.
2. Check the following:

#	Signal name	Test point	Voltage (all bands)
1	VCTCXO supply	R7501	2.5 V

Copyright © 2008 Nokia. All rights reserved.

#	Signal name	Test point	Voltage (all bands)
2	AHNEUS supply from DC/DC conv	L7502	3.2 V
3	TXFEM supply	C7523	3.9 V
4	WCDMA PA supply from DC/DC conv	C7543	0 V (When transmitting 1.3 V - 3.1 V depending on output power. *3.1 V with settings as in the note below.)
5	Vbat at WCDMA PA	L7550	3.9 V
6	Supply to AHNEUS DC/DC conv	L7592	3.9 V

* With these settings, the result should be 3.1V.

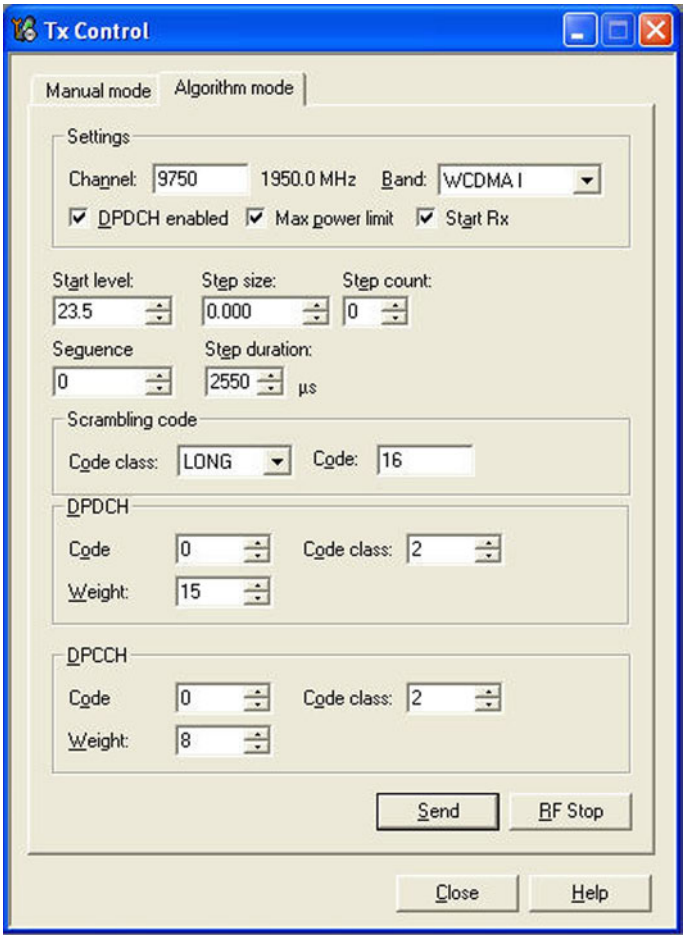


Figure 31 Tx Control window

Copyright © 2008 Nokia. All rights reserved.

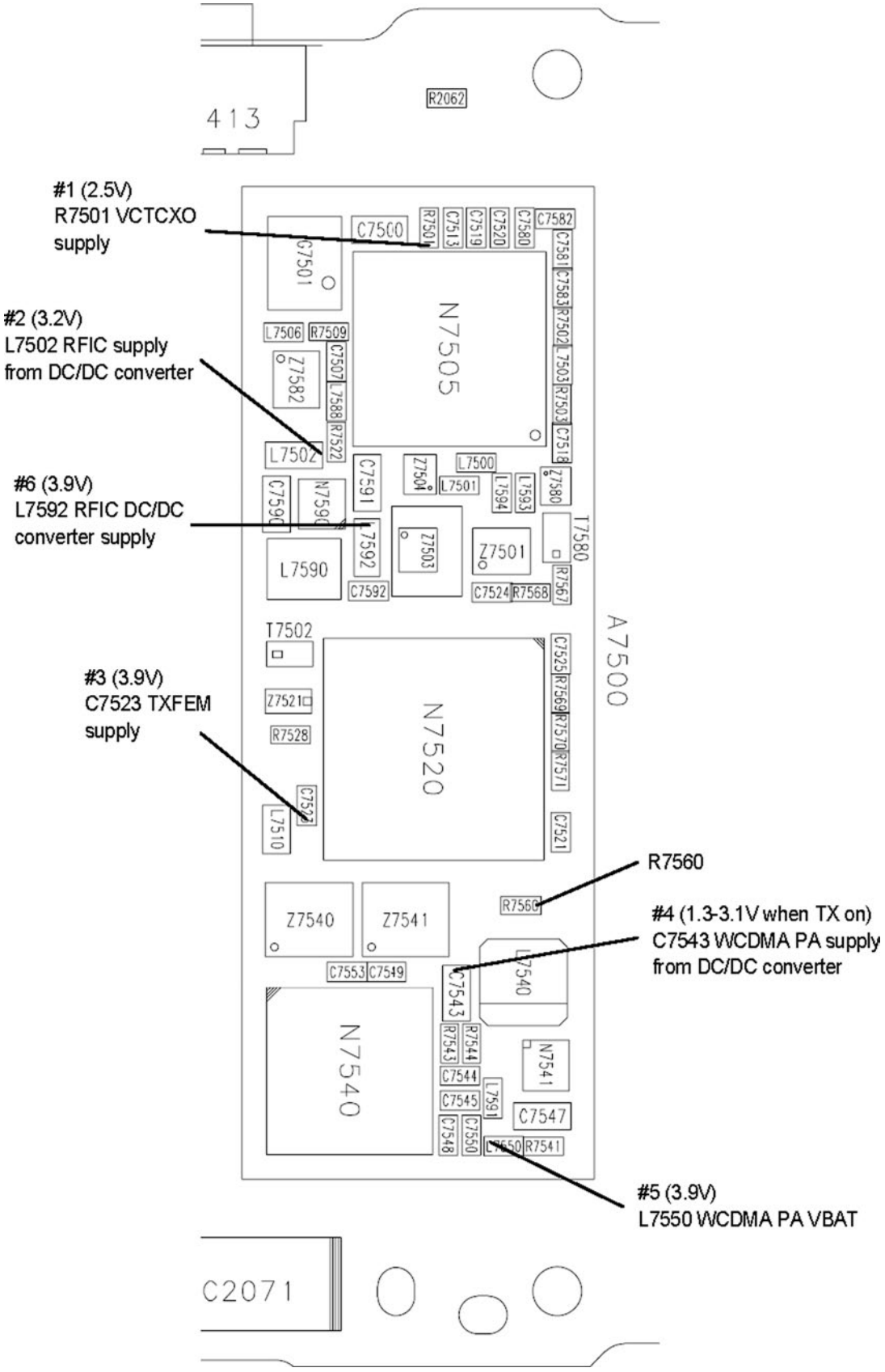
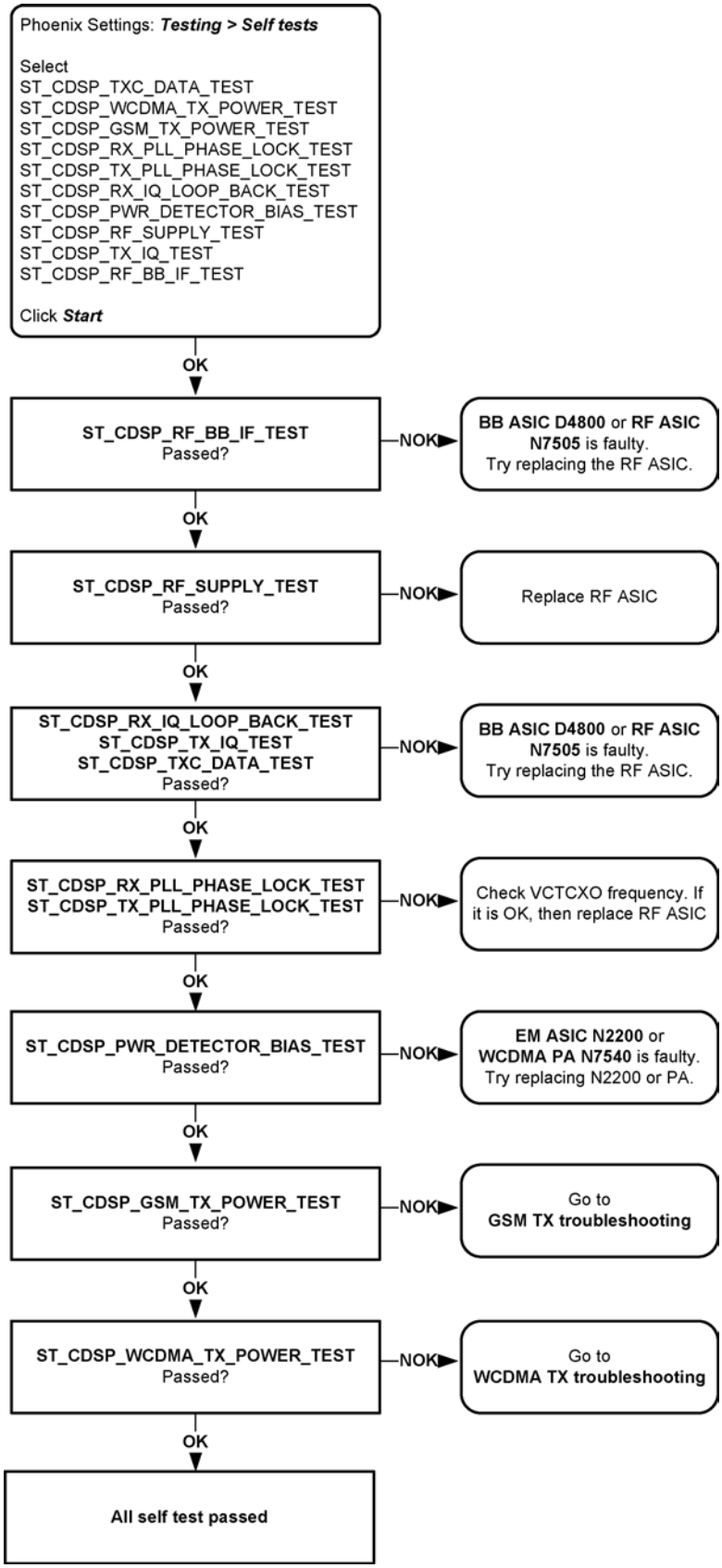


Figure 32 General voltage checking test points

Copyright © 2008 Nokia. All rights reserved.

Self test troubleshooting

Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Receiver troubleshooting

Introduction to receiver (RX) troubleshooting

RX can be tested by making a phone call or in local mode. For the local mode testing, use Phoenix service software.

The main RX troubleshooting measurement is RSSI reading. This test measures the signal strength of the received signal. For GSM RSSI measurements, see GSM RX chain activation for manual measurements / GSM RSSI measurement (page 4–12). For a similar test in WCDMA mode, see WCDMA RX chain activation for manual measurement / WCDMA RSSI measurement (page 4–13).

GSM RX chain activation for manual measurements/GSM RSSI measurement

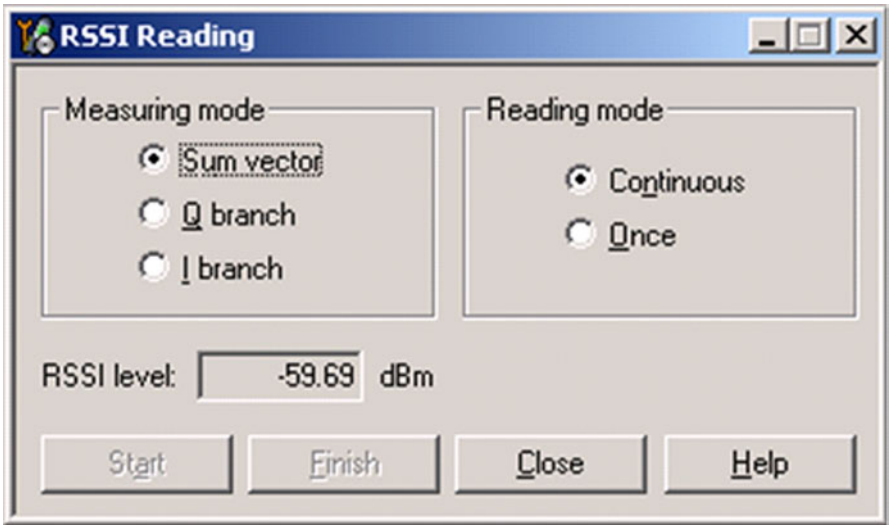
Prerequisites

Make the following settings in Phoenix service software:

Setting	GSM850	GSM900	GSM1800	GSM1900
Phoenix Channel	189	37	700	661
Signal generator to antenna connector	881.46771MHz (67.71KHz offset) at -60dBm	942.46771MHz (67.71kHz offset) at -60dBm	1842.86771MHz (67.71kHz offset) at -60dBm	1960.06771MHz (67.71kHz offset) at -60dBm

Steps

1. Set the phone to local mode.
2. Activate RSSI reading in Phoenix (**Testing→GSM→RSSI reading**)



Results

The reading should reflect the level of the signal generator (-losses) +/- 5 dB.

When varying the level in the range -30 to -102 dBm the reading should then follow within +/-5 dB.

Copyright © 2008 Nokia. All rights reserved.

WCDMA RX chain activation for manual measurement/WCDMA RSSI measurement

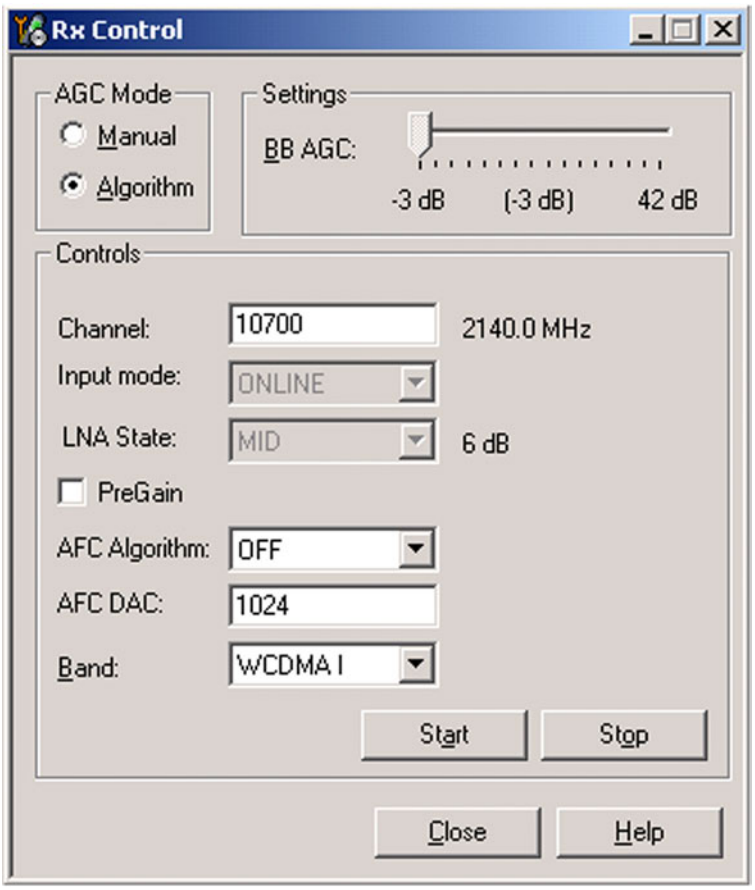
Prerequisites

Make the following settings in Phoenix service software and in the signal generator.

Setting	WCDMA Band I (2100)	WCDMA Band VIII (900)
Phoenix channel	10700	3013
Signal generator to antenna connector	2141.0 MHz	942.6 MHz
Signal generator Rf-level (CW-signal)	-70 dBm	-70 dBm

Steps

1. Via Phoenix Testing menu, choose **WCDMA/RX Control**.
2. In the RX control window, make the following settings (adjust Channel and Band according to the table above):



3. Click **Start** to activate the settings.

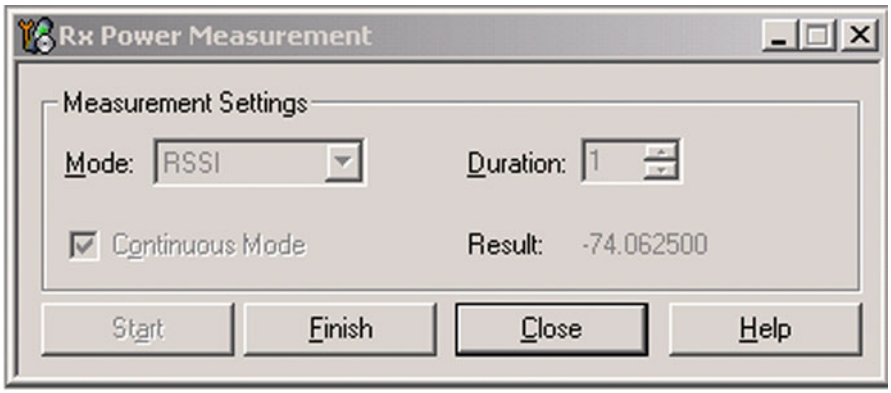
   If the settings are changed later on (for example, change of channel) you have to click **Stop** and **Start** again.

   Note: Clicking **Stop** also disables TX control if it was active.

4. From the Phoenix testing menu, select **WCDMA→RX Power measurement**

Copyright © 2008 Nokia. All rights reserved.

5. In the RX Power measurement window, select:
   - Mode: RSSI
   - Continuous mode



6. Click **Start** to perform the measurement.

Results

The reading should reflect the level of the signal generator (-losses) ± 5 dB.

Transmitter troubleshooting

General instructions for transmitter (TX) troubleshooting

Please note the following before performing transmitter tests:

- TX troubleshooting requires TX operation.
- Do not transmit on frequencies that are in use!
- The transmitter can be controlled in local mode for diagnostic purposes.
- The most useful Phoenix tool for GSM transmitter testing is “RF Controls”; in WCDMA transmitter testing the best tool is “TX Control”.
- Remember that re-tuning is not a fix! Phones are tuned correctly in production

  Note: Never activate the GSM or WCDMA transmitter without a proper antenna load. Always connect a 50 Ω load to the RF connector (antenna, RF-measurement equipment or at least a 2 W dummy load); otherwise the GSM or WCDMA Power amplifier (PA) may be damaged.

GSM transmitter troubleshooting

Steps

1. Set the phone to local mode.
2. Activate RF controls in Phoenix (**Testing→GSM→Rf Controls**).

   Make settings as shown in the picture:

   Note: These settings are for GSM 900 band, if troubleshooting for other bands is necessary, adjust the settings according to the troubleshooting flowchart.

Copyright © 2008 Nokia. All rights reserved.

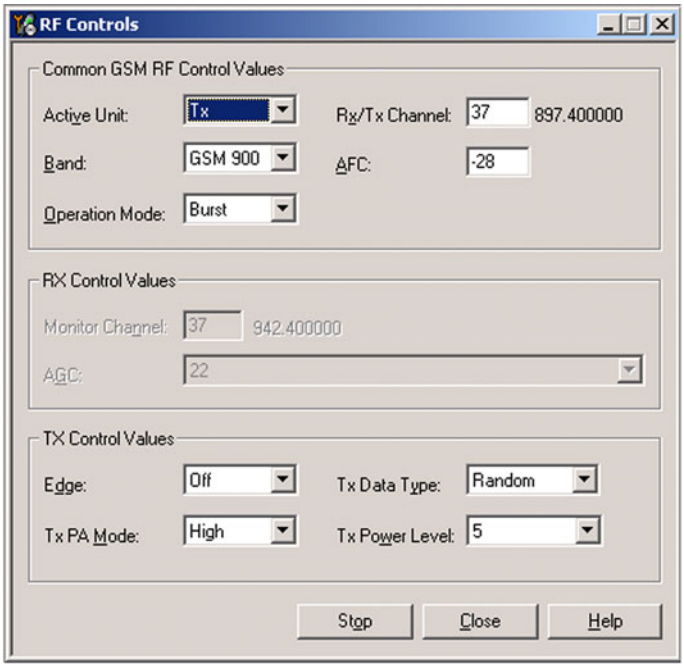


Figure 33 RF control window

3. Check the basic TX parameters (i.e. power, phase error, modulation and switching spectrum), using a communication analyser (for example CMU200).

Copyright © 2008 Nokia. All rights reserved.

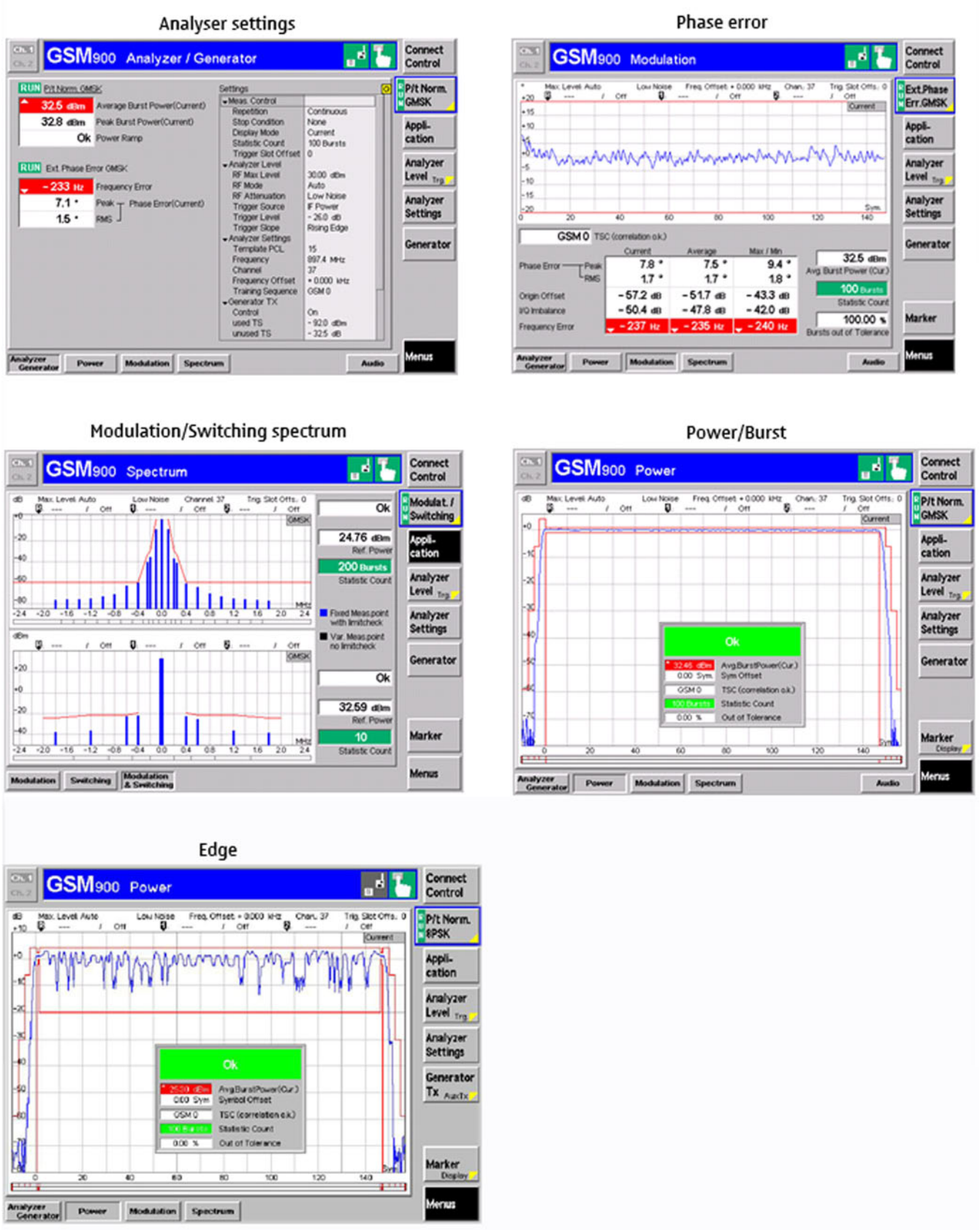


Figure 34 Typical readings

4. Change power level (RF controls) and make sure the power reading follows accordingly.

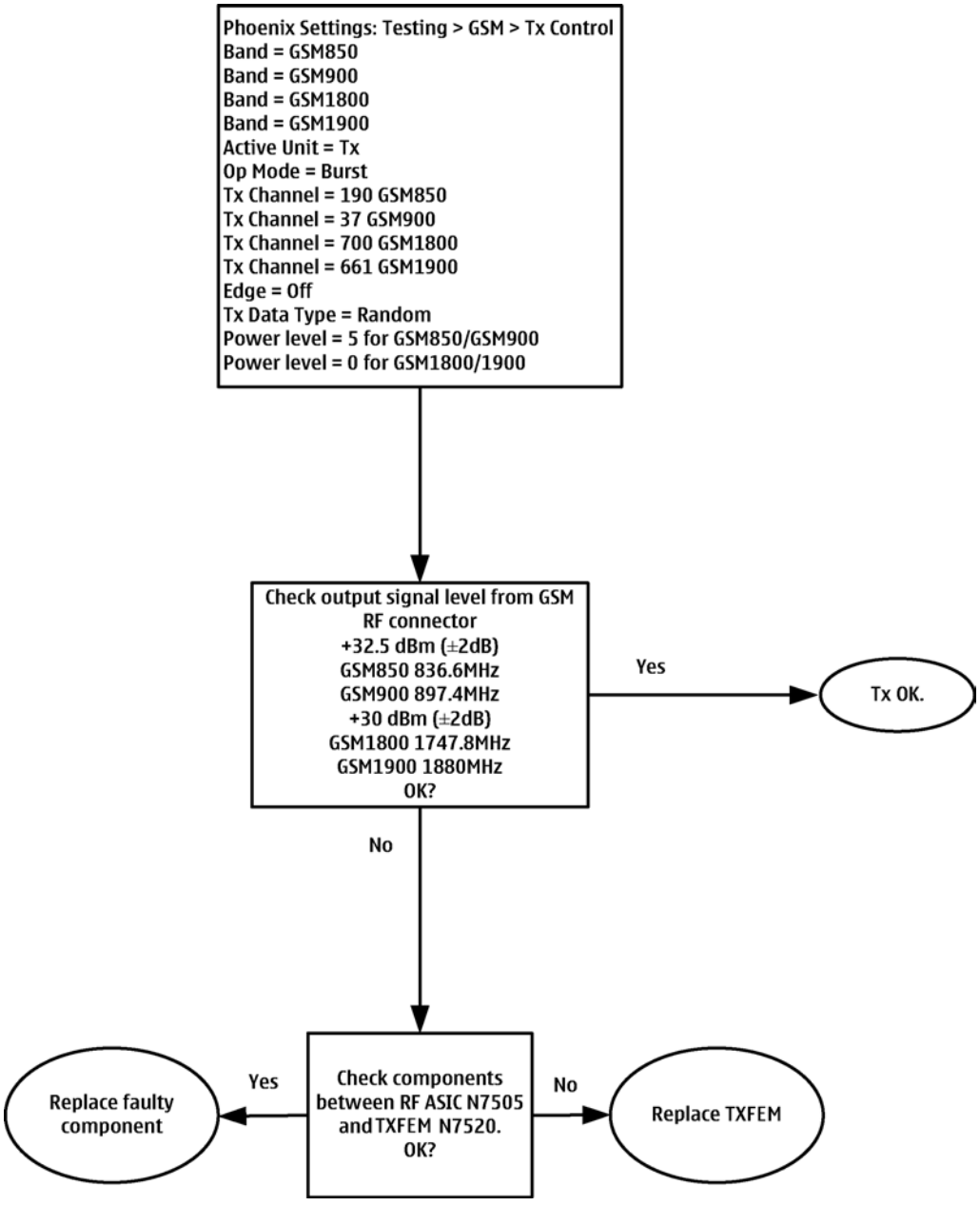
Copyright © 2008 Nokia. All rights reserved.

Next actions

If you want to troubleshoot the other bands, change band with RF controls and set the communication analyser accordingly.

GSM transmitter troubleshooting flowchart

Troubleshooting flow



WCDMA transmitter troubleshooting

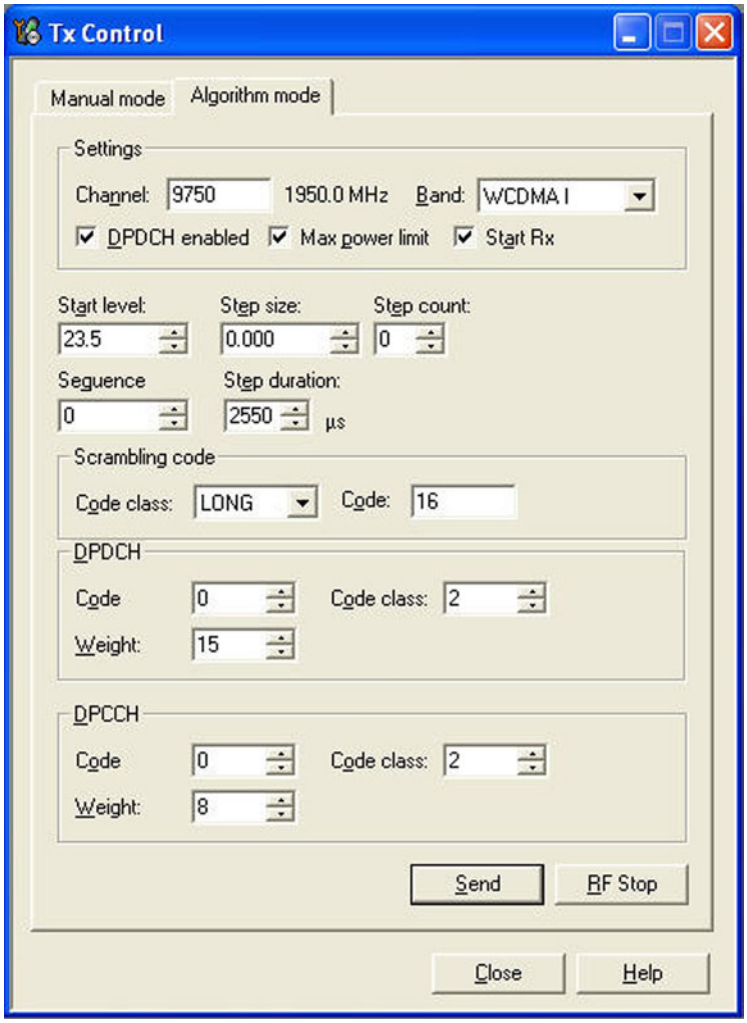
Steps

1. Set the phone to local mode.
2. In Phoenix, select **Testing→WCDMA→TX control** .

Copyright © 2008 Nokia. All rights reserved.

3. In the TX control window, make settings like in the picture:

   Note: If troubleshooting for WCDMA900 (VIII) is needed, only changes needed are Band and Channel.

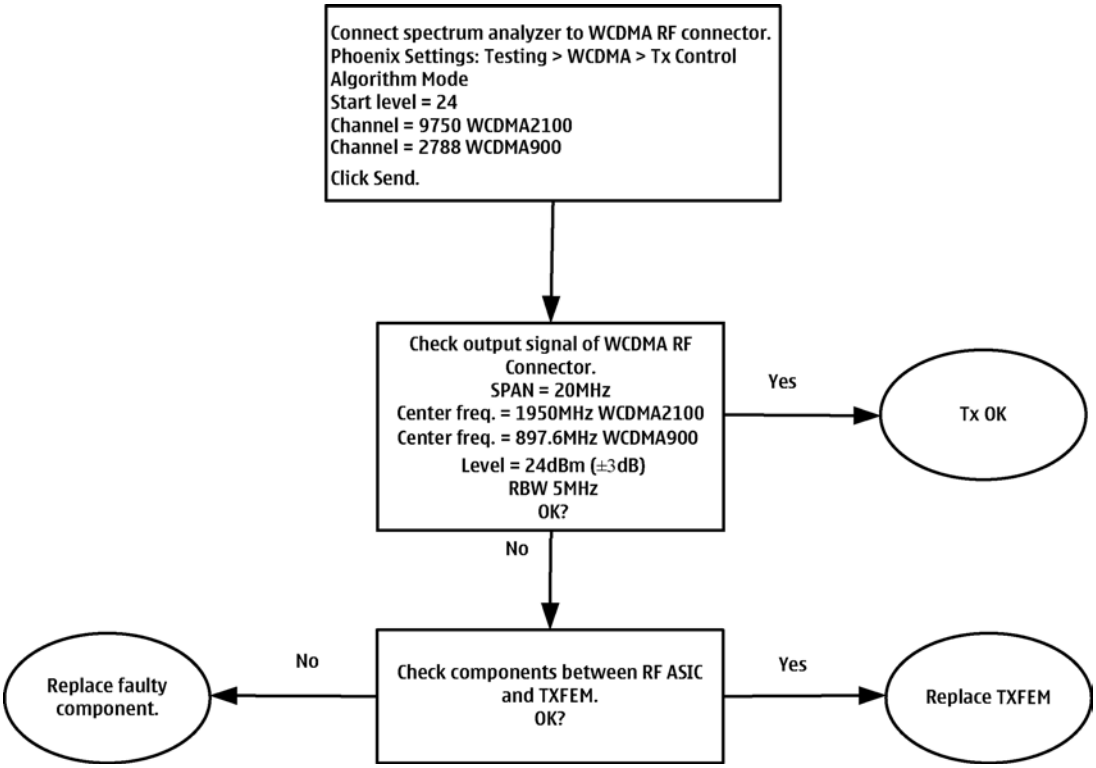


4. Click **Send** to enable the settings and activate TX.
   If settings are changed (eg. new channel), you have to click **RF Stop** and **Send** again.

Copyright © 2008 Nokia. All rights reserved.

WCDMA transmitter troubleshooting flowchart

Troubleshooting flow



WLAN RF troubleshooting

Introduction to WLAN RF troubleshooting

Caution:

- Most RF semiconductors are static discharge sensitive. ESD protection must be taken care of during repair (ground straps and ESD soldering irons).
- N6300 and N6301 are moisture sensitive so parts must be pre-baked prior to soldering. In addition to key components described in this section, there are a lot of discrete components (resistors, inductors and capacitors) for which troubleshooting is done by checking if soldering of the component is done properly (for factory repairs checking if it is missing from PWB).

The WLAN RF section mainly consists of the WLAN ASIC STLC4560 (N6300), the Front End Module, FEM (N6301), the 2.4GHz filter (Z6300), the antenna diplexer (Z6650) and the WLAN antenna embedded in the battery cover.

The WLAN troubleshooting is divided into two major sections: radiated and conducted testing. Radiated testing is further divided into two parts.

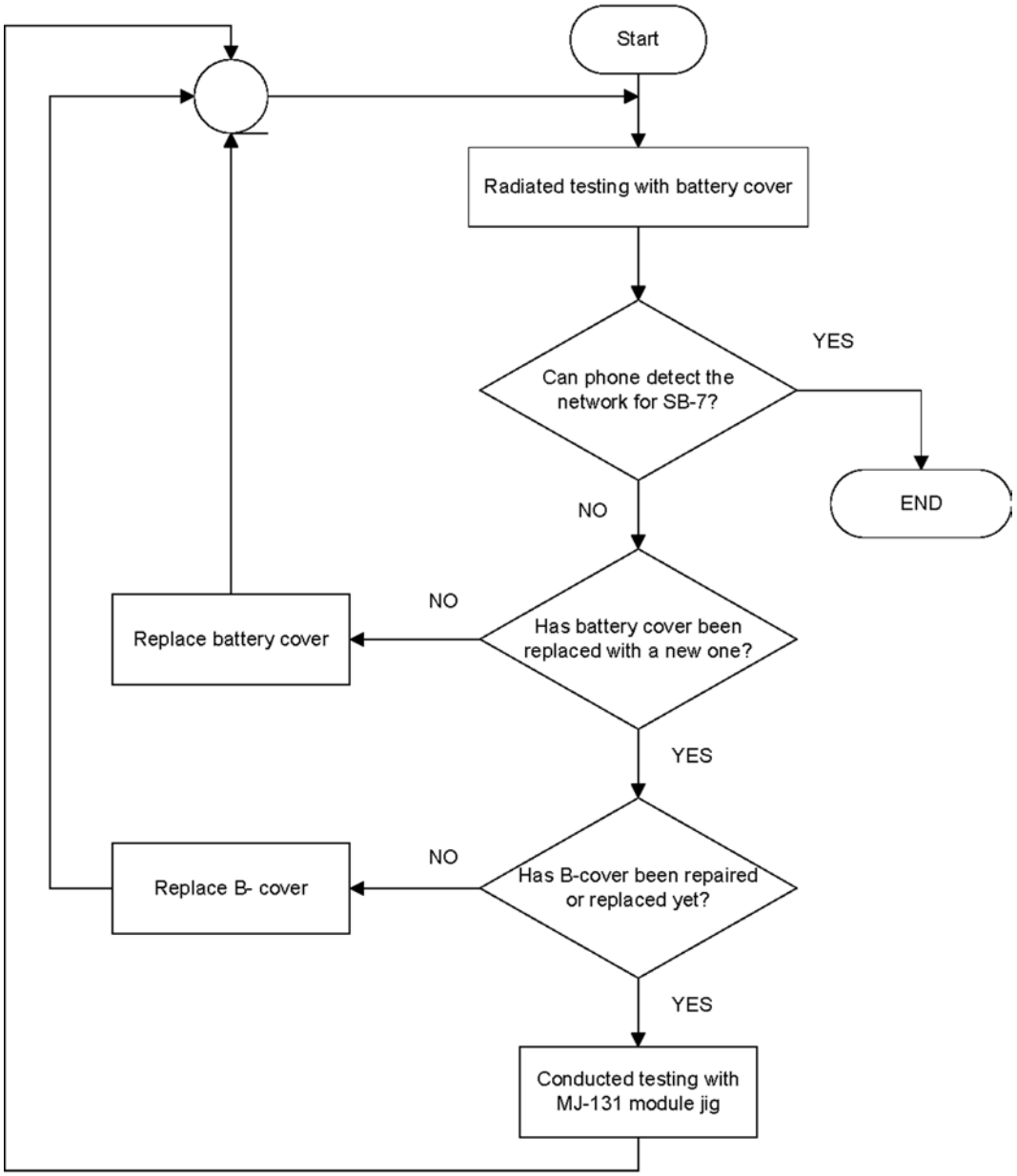
The conducted testing is to identify problems that may be caused by WLAN circuits on the phone PWB. See the General WLAN RF troubleshooting flowchart. This test also has two sub-tests: the WLAN front-end test and the WLAN ASIC test. The WLAN autotune is performed if either the FEM or the WLAN ASIC is replaced with a new one.

All RF measurements should be done using a spectrum analyzer and TX power is measured in channel power, dBm/22MHz. An oscilloscope with a 10:1 probe is used for DC-voltages and low frequency signals measurements. Short circuits on capacitors and resistor values can be verified with an ohmmeter.

Copyright © 2008 Nokia. All rights reserved.

General WLAN RF troubleshooting

Troubleshooting flow



Radiated testing with battery cover

Context

This test is to isolate the problem caused by the contact point between battery cover and the pogo pin on the B cover.

Copyright © 2008 Nokia. All rights reserved.

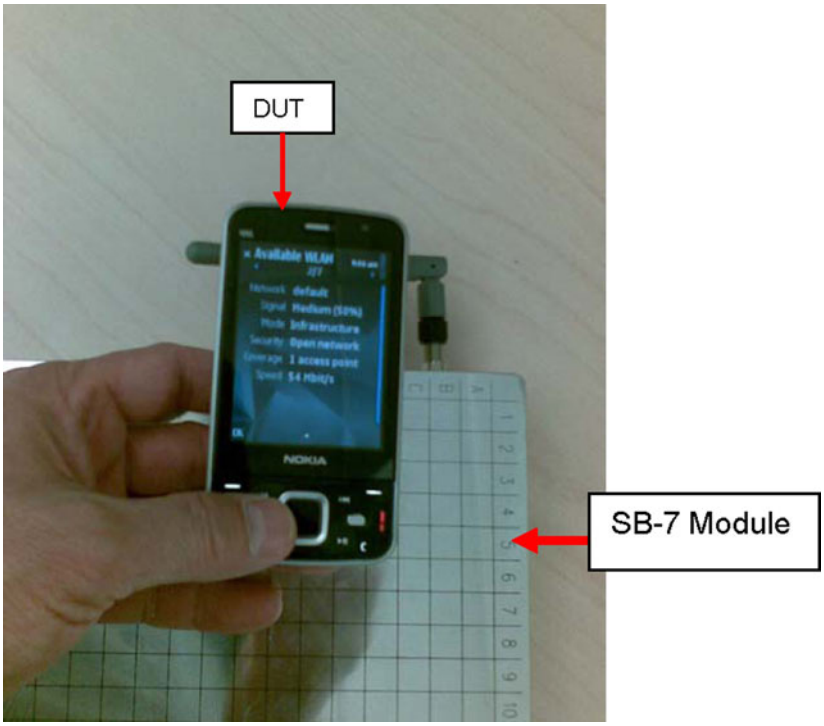


Figure 35 Test equipment setup

Steps

1. Set up the test equipment as shown in the figure above.
2. Power up the SB-7 module.
3. Power up the DUT with a fully charged battery.
4. Hold the phone about 1.5" above and parallel to the SB-7's antenna as shown in the figure above
5. Under the phone's Connectivity icon, select **Connect Manager→Available WLAN networks** . The display will show a list of available WLAN networks.
6. Select the network with a name "default". The phone display will show:
   - Network: default
   - Signal: Medium (~50%)
   - Mode: Infrastructure
   - Security: Open network
   - Coverage: 1 access point
   - Speed: 54 Mbit/s

   If phone doesn't display the available SB-7 signal, there is something wrong with the WLAN.

   Note: To verify if this is the network signal from the SB-7, switch off the SB-7 and search the WLAN network again. If the "default" network is not available anymore, then this proves the network signal is from the SB-7.

Conducted testing with MJ-131 module jig

This test is to find the problem caused by the WLAN related circuits on the phone PWB.

Copyright © 2008 Nokia. All rights reserved.

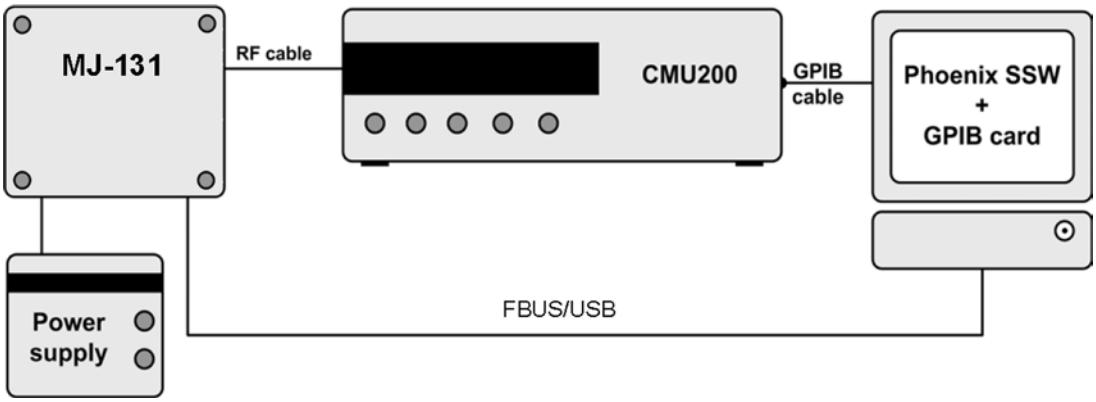


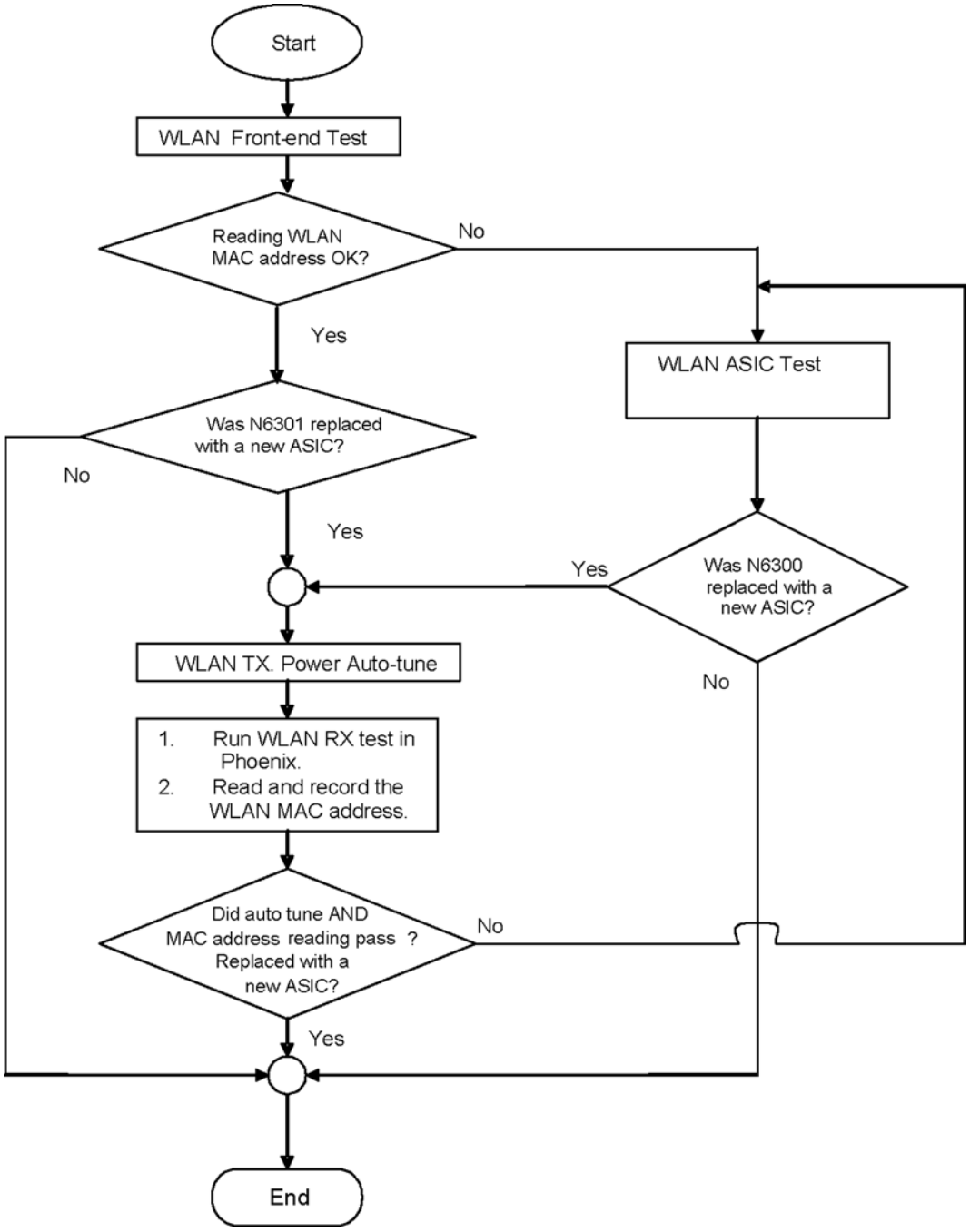
Figure 36 Test equipment setup for conductive test

The conducted test is divided into two sub-tests: the WLAN front-end test and the WLAN ASIC test. The troubleshooting flow is shown in the Conducted WLAN troubleshooting flowchart, and test procedures and flowcharts for two sub-tests are explained in different flowcharts in the following pages. The Front-end test is performed to identify the defective components including the FEM, output filter and the diplexer in the antenna matching circuit area.

Copyright © 2008 Nokia. All rights reserved.

Conducted WLAN troubleshooting

Troubleshooting flow



WLAN front-end test

Steps

1. Connect the MJ-131 test jig's FBUS connector to a computer with a DAU-9S cable. Alternatively, if you are using FPS-8, use an XCS-4 modular cable and a USB cable.

   Note: Make sure that you have a PKD-1 dongle connected to the computer parallel port.

Copyright © 2008 Nokia. All rights reserved.

2. Connect a DC power supply to the module test jig with a power cable.

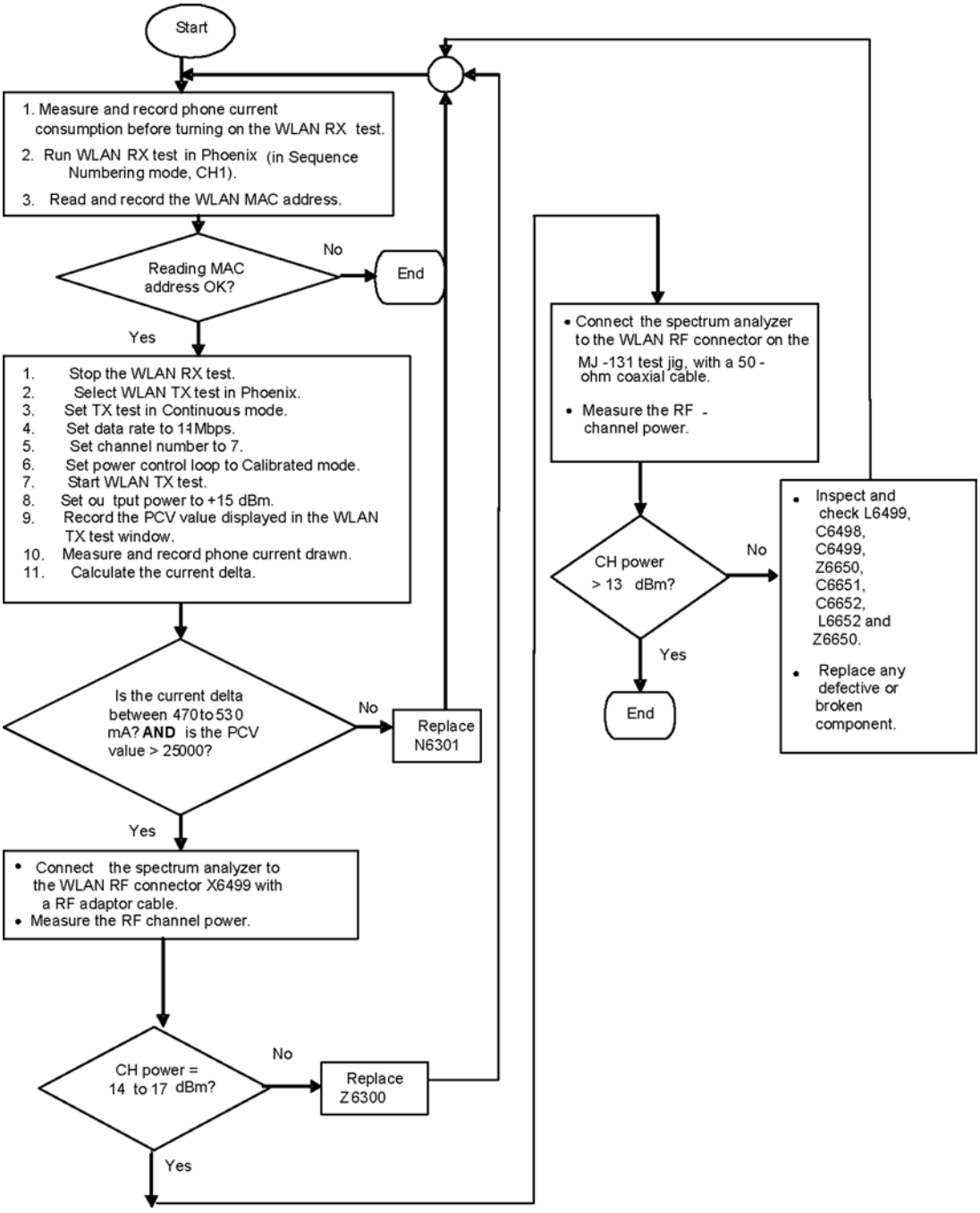
   Note: Turn off the DC power supply at this stage.
3. Set the DC supply voltage to 4.2 V.
4. Set the jumper connector on the test jig to the **bypass** position.
5. Set the phone mode switch to **LOCAL** position.
6. Place the phone module to the test jig.
7. Turn on the DC power supply, and wait for the LED jig to turn on.
8. Start Phoenix service software on your PC.

   Note: Make sure that the Phoenix service software version on your computer is not older than version of week 8 of 2008.
9. Initialize Phoenix connection to the phone.
10. Choose **File→Scan Product** . Phone should be powered up in the LOCAL mode.
11. Once the Phoenix identifies the phone's product information, follow the WLAN front-end troubleshooting procedure as shown in the flowchart below.

Copyright © 2008 Nokia. All rights reserved.

WLAN front-end troubleshooting

Troubleshooting flow


Start
1. Measure and record phone current consumption before turning on the WLAN RX test.
2. Run WLAN RX test in Phoenix (in Sequence Numbering mode, CH1).
3. Read and record the WLAN MAC address.
Reading MAC address OK?
No
End
Yes
1. Stop the WLAN RX test.
2. Select WLAN TX test in Phoenix.
3. Set TX test in Continuous mode.
4. Set data rate to 11Mbps.
5. Set channel number to 7.
6. Set power control loop to Calibrated mode.
7. Start WLAN TX test.
8. Set ou tput power to +15 dBm.
9. Record the PCV value displayed in the WLAN TX test window.
10. Measure and record phone current drawn.
11. Calculate the current delta.
Is the current delta between 470to530 mA? AND is the PCV value > 25000?
No
Replace N6301
Yes
• Connect the spectrum analyzer to the WLAN RF connector X6499 with a RF adaptor cable.
• Measure the RF channel power.
CH power = 14 to 17 dBm?
No
Replace Z6300
Yes
• Connect the spectrum analyzer to the WLAN RF connector on the MJ -131 test jig, with a 50 - ohm coaxial cable.
• Measure the RF - channel power.
CH power > 13 dBm?
No
Yes
End
• Inspect and check L6499, C6498, C6499, Z6650, C6651, C6652, L6652 and Z6650.
• Replace any defective or broken component.

WLAN ASIC test

Steps

1. Connect the MJ-131 test jig's FBUS connector to a computer with a DAU-9S cable. Alternatively, if you are using FPS-8, use an XCS-4 modular cable and a USB cable.

   Note: Make sure that you have a PKD-1 dongle connected to the computer parallel port.

Copyright © 2008 Nokia. All rights reserved.

2. Connect a DC power supply to the module test jig with a power cable.

   Note: Turn off the DC power supply at this stage.
3. Set the DC supply voltage to 4.2 V.
4. Set the jumper connector on the test jig to the **bypass** position.
5. Set the phone mode switch to **LOCAL** position.
6. Place the phone module to the test jig.
7. Turn on the DC power supply, and wait for the LED jig to turn on.
8. Start Phoenix service software on your PC.

   Note: Make sure that the Phoenix service software version on your computer is not older than version of week 8 of 2008.
9. Initialize Phoenix connection to the phone.
10. Choose **File→Scan Product** .
11. Once the Phoenix identifies the phone's product information, referring to the following figure of test points, follow the WLAN ASIC troubleshooting procedure as shown in the flowchart below. The red arrows shown in the figures below are pointing to the test points mentioned in the troubleshooting flowchart. Measure the voltage and frequency with a 10:1 high impedance scope probe.

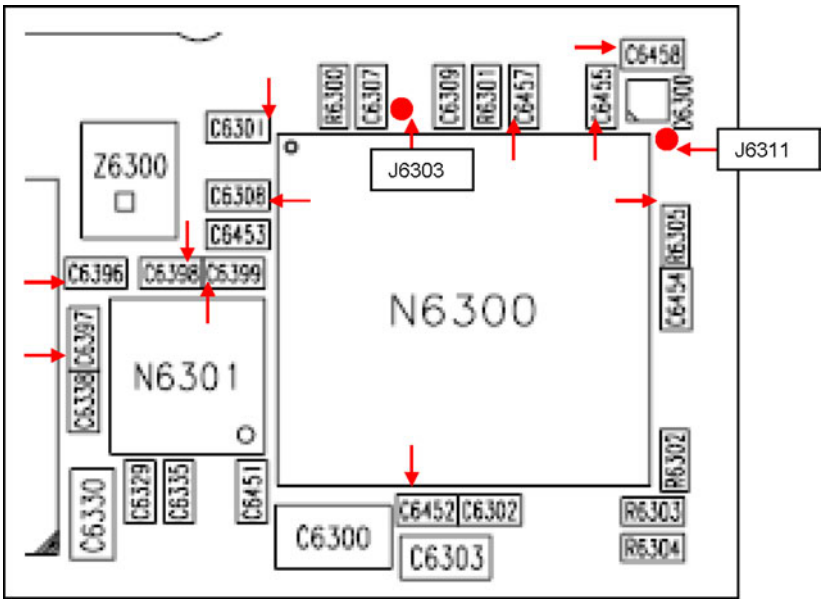


Figure 37 Test points around the WLAN ASIC

Copyright © 2008 Nokia. All rights reserved.

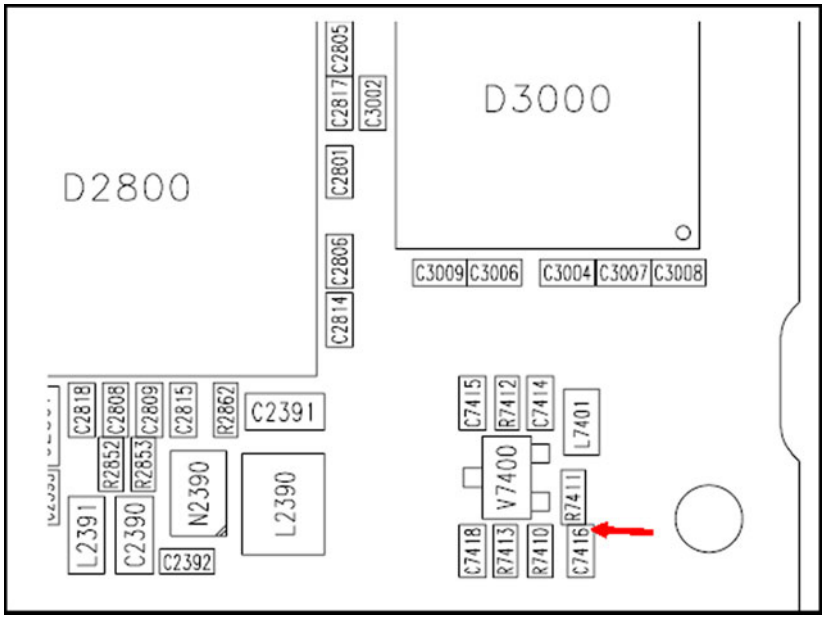
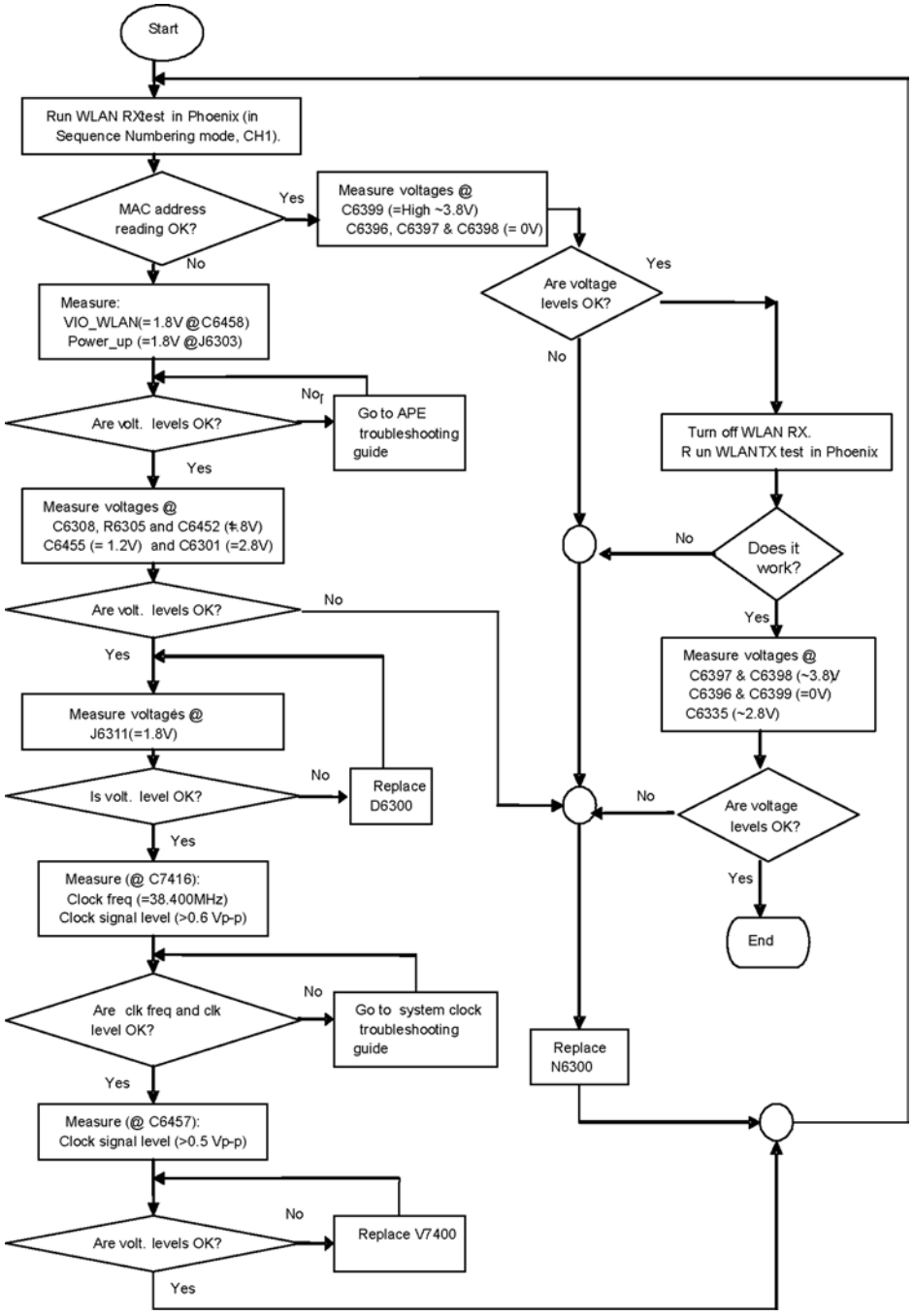


Figure 38 Test point around the clock buffer circuit

Copyright © 2008 Nokia. All rights reserved.

WLAN ASIC troubleshooting

Troubleshooting flow



WLAN Tx power autotuning

For WLAN Tx power autotuning instructions, please refer to the WLAN autotuning (page 4–7) section.

Copyright © 2008 Nokia. All rights reserved.

5 — Camera Module Troubleshooting

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Main (back) camera troubleshooting flowcharts 5–5
Main camera troubleshooting 5–5
Main camera baseband troubleshooting 5–6
Main camera baseband troubleshooting - powerings 5–7
Main camera viewfinder troubleshooting 5–8
Bad image quality troubleshooting 5–9
Privacy LED and Flash LED troubleshooting 5–10
Secondary (front) camera troubleshooting 5–12

Copyright © 2008 Nokia. All rights reserved.

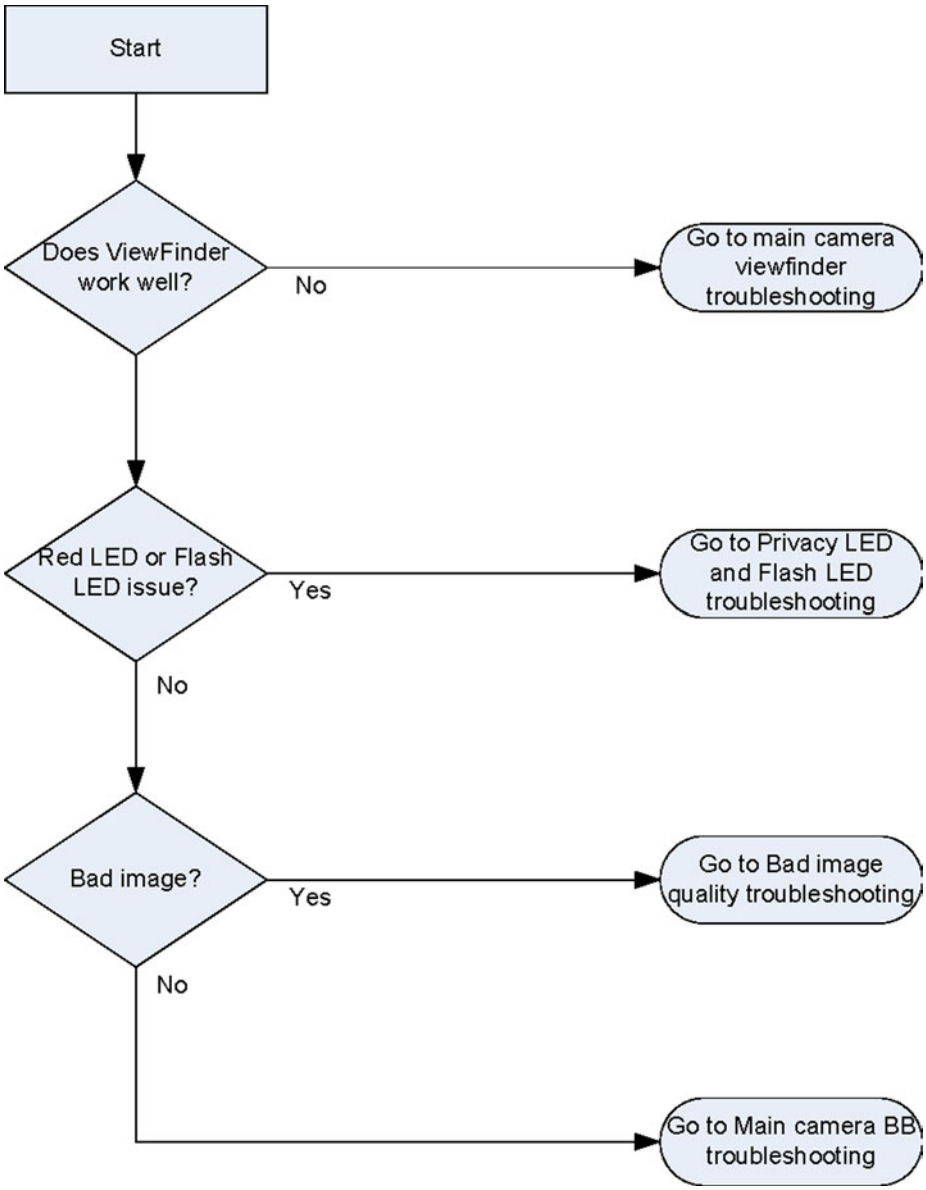
(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Main (back) camera troubleshooting flowcharts

Main camera troubleshooting

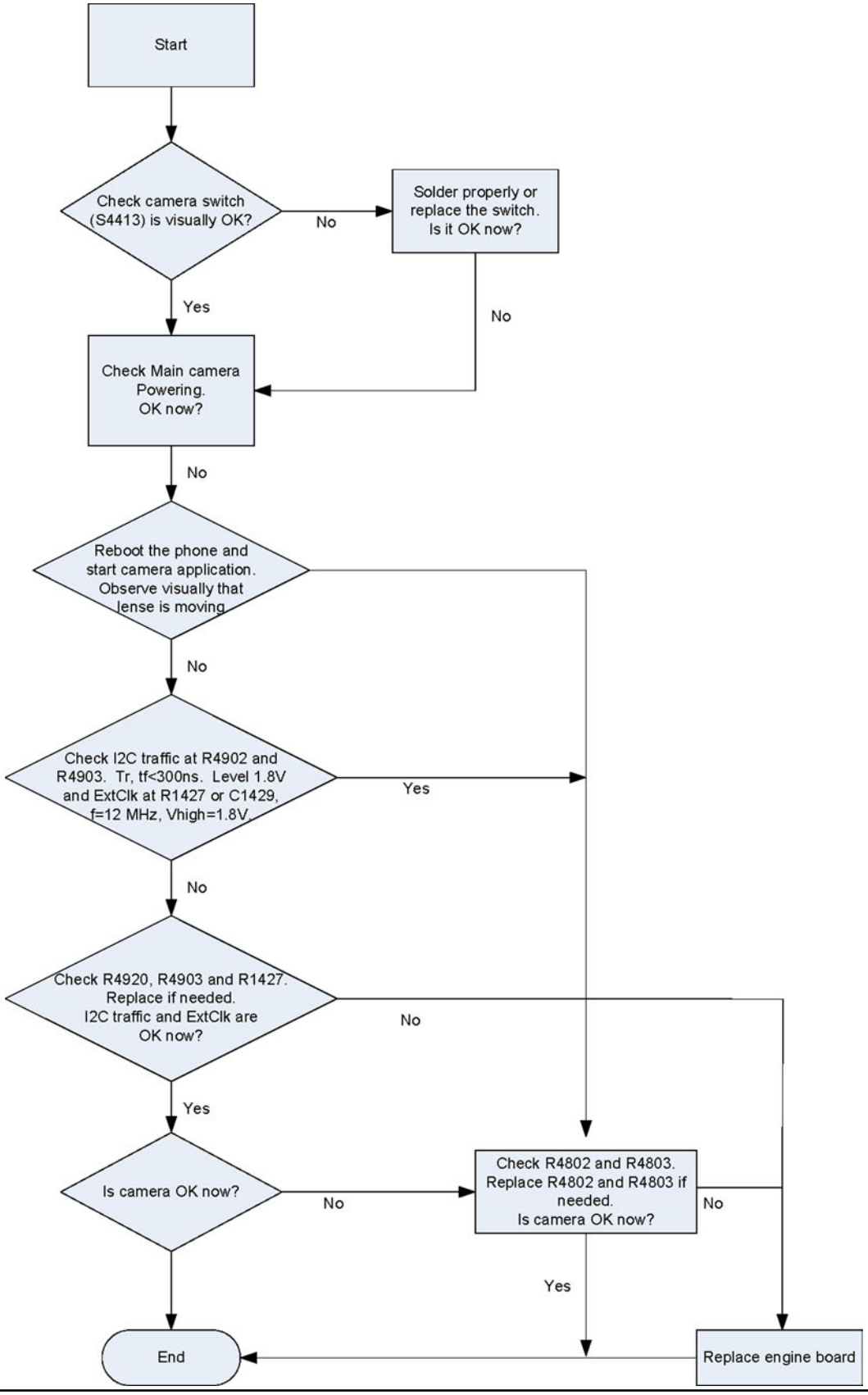
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Main camera baseband troubleshooting

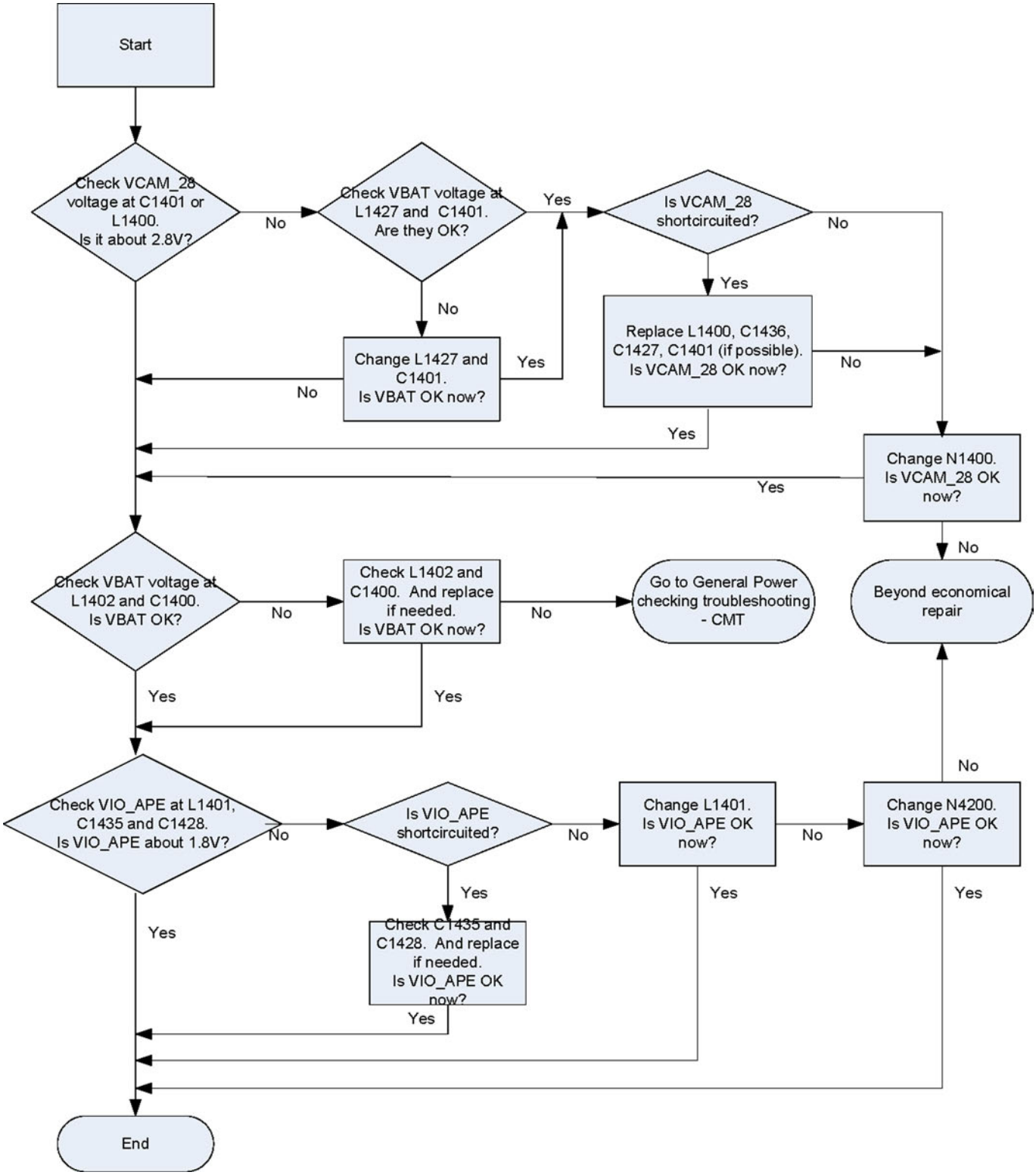
Troubleshooting flow


Start
Check camera switch (S4413) is visually OK?
No
Solder properly or replace the switch. Is it OK now?
No
Yes
Check Main camera Powering. OK now?
No
Reboot the phone and start camera application. Observe visually that lense is moving.
No
Check I2C traffic at R4902 and R4903. Tr, tf<300ns. Level 1.8V and ExtClk at R1427 or C1429, f=12 MHz, Vhigh=1.8V.
Yes
No
Check R4920, R4903 and R1427. Replace if needed. I2C traffic and ExtClk are OK now?
No
Yes
Is camera OK now?
No
Check R4802 and R4803. Replace R4802 and R4803 if needed. Is camera OK now?
No
Yes
End
Replace engine board

Copyright © 2008 Nokia. All rights reserved.

Main camera baseband troubleshooting - powerings

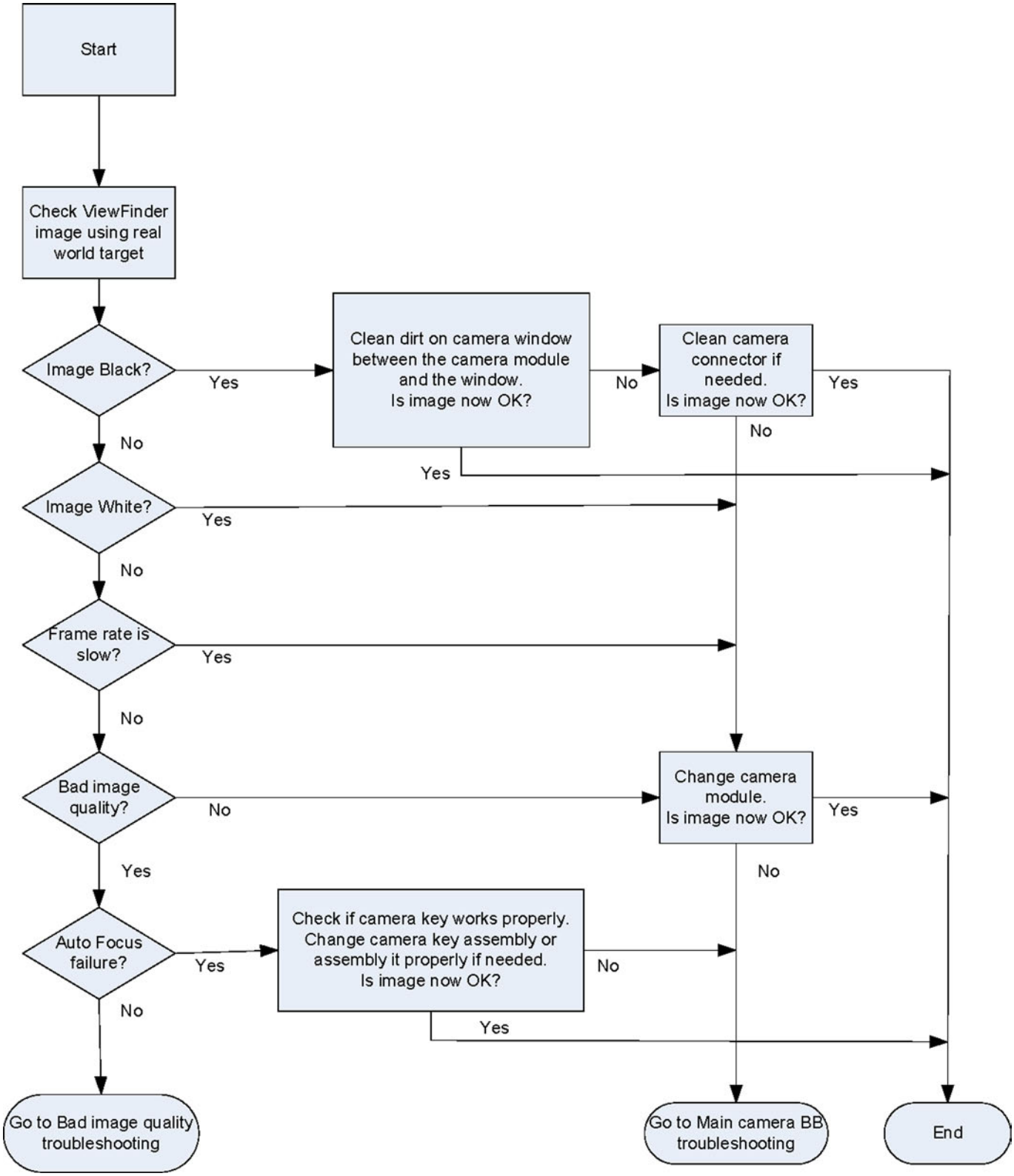
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Main camera viewfinder troubleshooting

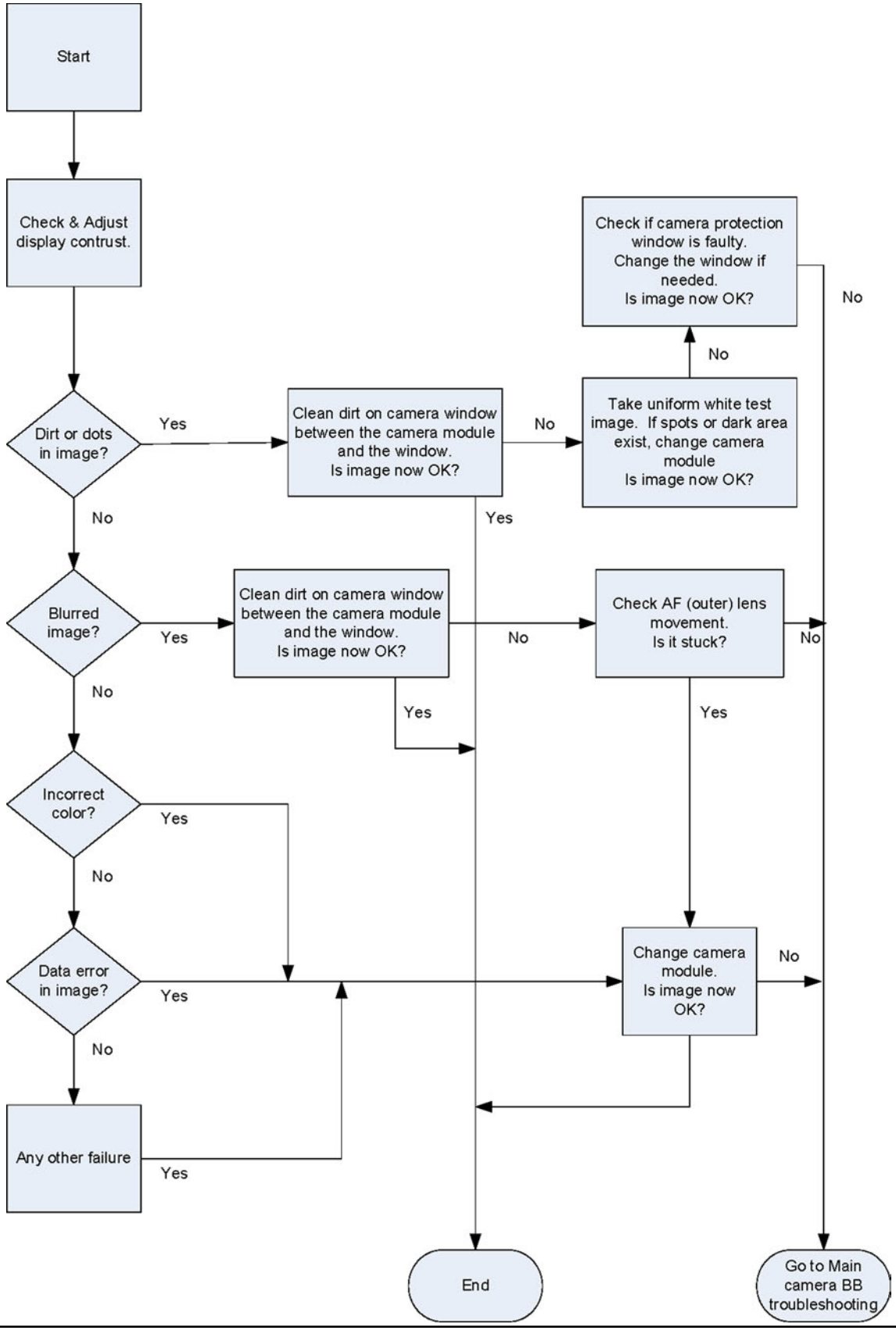
Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

Bad image quality troubleshooting

Troubleshooting flow



Copyright © 2008 Nokia. All rights reserved.

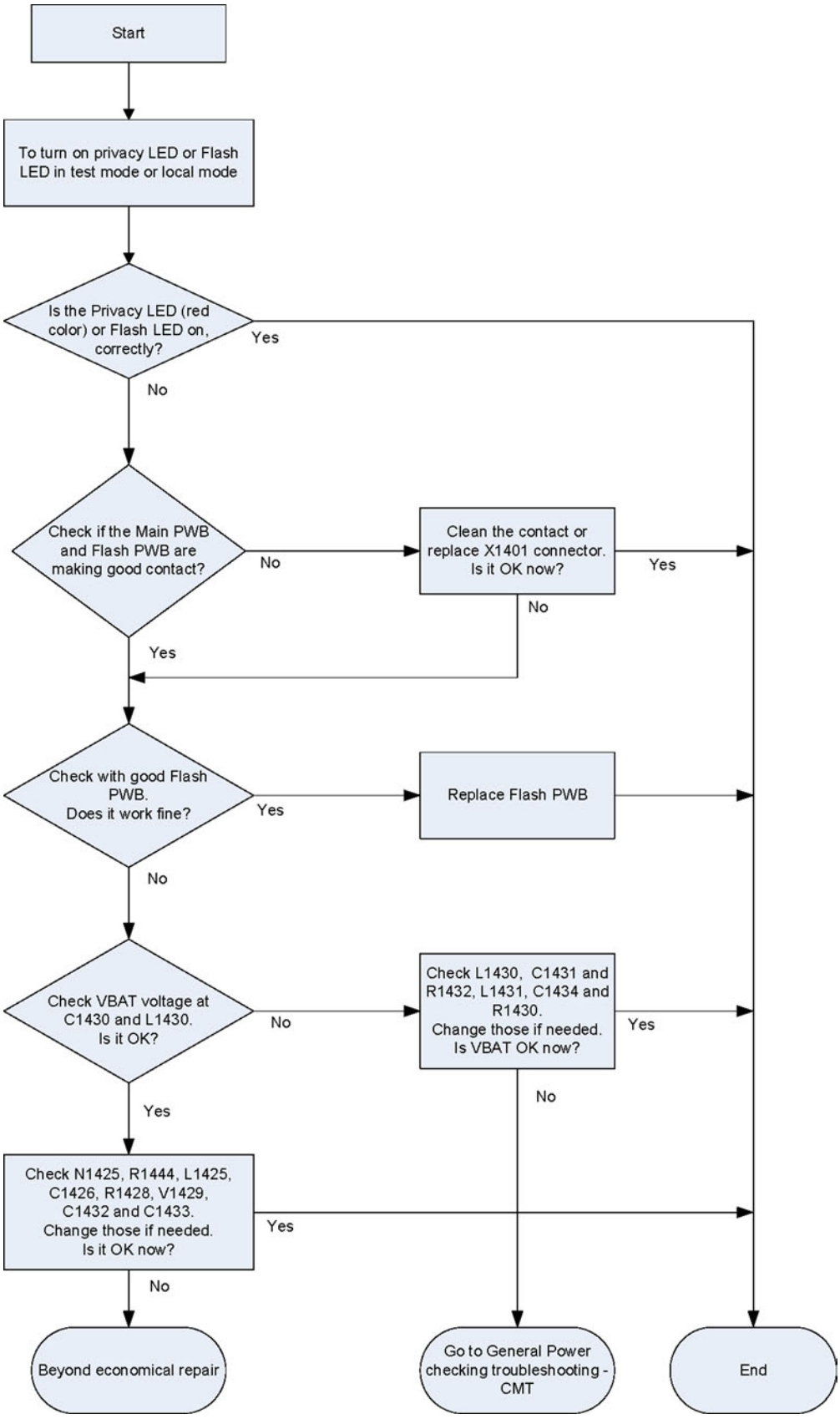
Privacy LED and Flash LED troubleshooting

Context

Note: Before checking flash functionality, make sure that the main camera is working OK.

Copyright © 2008 Nokia. All rights reserved.

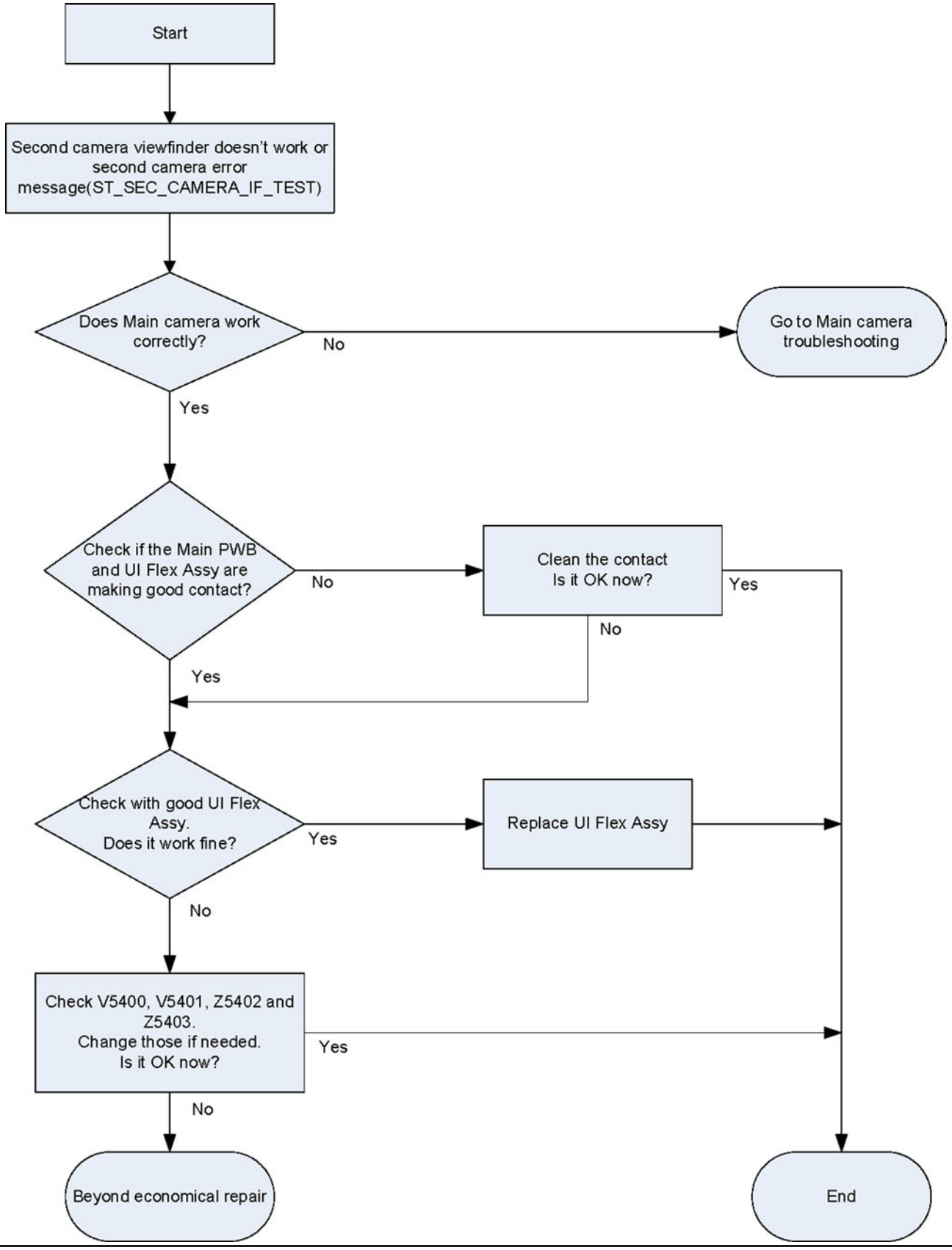
Troubleshooting flow


Start
To turn on privacy LED or Flash LED in test mode or local mode
Is the Privacy LED (red color) or Flash LED on, correctly?
Yes
No
Check if the Main PWB and Flash PWB are making good contact?
No
Clean the contact or replace X1401 connector. Is it OK now?
Yes
No
Yes
Check with good Flash PWB. Does it work fine?
Yes
Replace Flash PWB
No
Check VBAT voltage at C1430 and L1430. Is it OK?
No
Check L1430, C1431 and R1432, L1431, C1434 and R1430. Change those if needed. Is VBAT OK now?
Yes
No
Yes
Check N1425, R1444, L1425, C1426, R1428, V1429, C1432 and C1433. Change those if needed. Is it OK now?
Yes
No
Beyond economical repair
Go to General Power checking troubleshooting - CMT
End

Copyright © 2008 Nokia. All rights reserved.

Secondary (front) camera troubleshooting

Troubleshooting flow


Start
Second camera viewfinder doesn't work or second camera error message(ST_SEC_CAMERA_IF_TEST)
Does Main camera work correctly?
No
Go to Main camera troubleshooting
Yes
Check if the Main PWB and UI Flex Assy are making good contact?
No
Clean the contact Is it OK now?
Yes
No
Yes
Check with good UI Flex Assy. Does it work fine?
Yes
Replace UI Flex Assy
No
Check V5400, V5401, Z5402 and Z5403. Change those if needed. Is it OK now?
Yes
No
Beyond economical repair
End

Copyright © 2008 Nokia. All rights reserved.

6 — TV troubleshooting

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Service instructions 6–5
Service instructions for DVB-H repairs 6–5
DVB-H setup and self test 6–5
Setup for DVB-H Self test 6–5
DVB-H Self test 6–5
DVB-H RF test measurement 6–6
Radiated DVB-H RF test measurement with Willtek 4403 universal coupler 6–6
Galvanic DVB-H RF test measurement with FS-51 6–8
Galvanic DVB-H RF test measurement with module jig 6–10
DVB-H engine R5 measurement guide 6–11
DVB-H troubleshooting 6–13
DVB-H troubleshooting 6–13

List of Tables

Table 13 Pass/Fail Failure codes 6–6
Table 14 Setup and target test values 6–8
Table 15 Setup and target test values 6–10

List of Figures

Figure 39 DVB-H RF test measurement setup 6–7
Figure 40 Setup of FS-51 with connector and signal generator 6–9
Figure 41 Phone disassembled and placed to jig 6–11
Figure 42 DVB-H module 6–11

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Service instructions

Service instructions for DVB-H repairs

Note: Please see service concepts from the Service tools and service concepts (page 6–18) chapter.

DVB-H setup and self test

Setup for DVB-H Self test

Steps

1. Connect the phone to setup with product specific adapter FS-51.
2. Start Phoenix and set Operation mode to **Local**
3. Provide SW update

DVB-H Self test

Prerequisites

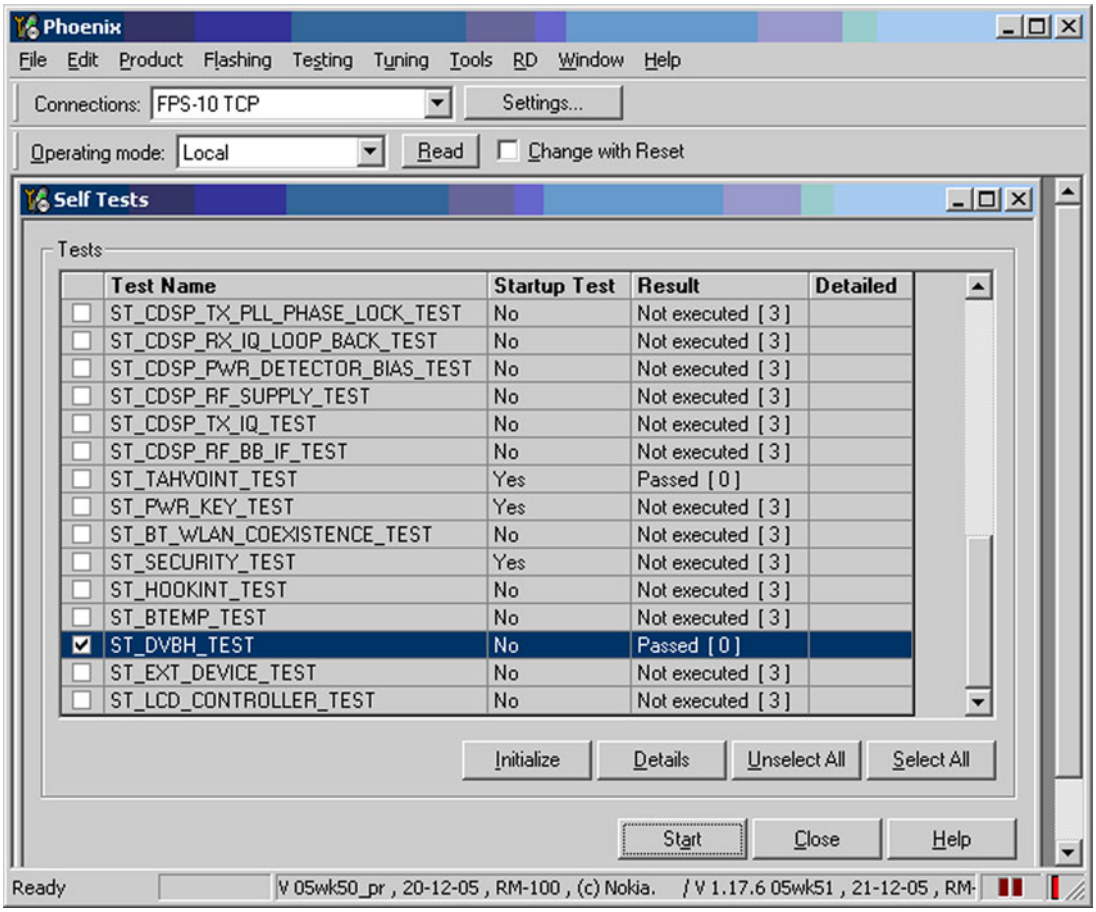
Run DVB-H Selftest in Phoenix (Selftest UI not available with FLS-4S. With FLS-5 the Selftest UI is available.)

Steps

1. From the **File** choose **Scan Product** .
2. From **Testing** menu select **Self Test**.
3. Select **ST_DVB-H_TEST box** (see figure below).

Copyright © 2008 Nokia. All rights reserved.

4. Press **Start**. The result can be seen from **Result** column.


Phoenix
File Edit Product Flashing Testing Tuning Tools RD Window Help
Connections: FPS-10 TCP
Settings...
Operating mode: Local
Read
Change with Reset
Self Tests
Tests
Test Name | Startup Test | Result | Detailed
ST_CDSP_TX_PLL_PHASE_LOCK_TEST | No | Not executed [3]
ST_CDSP_RX_IQ_LOOP_BACK_TEST | No | Not executed [3]
ST_CDSP_PWR_DETECTOR_BIAS_TEST | No | Not executed [3]
ST_CDSP_RF_SUPPLY_TEST | No | Not executed [3]
ST_CDSP_TX_IQ_TEST | No | Not executed [3]
ST_CDSP_RF_BB_IF_TEST | No | Not executed [3]
ST_TAHVOINT_TEST | Yes | Passed [0]
ST_PWR_KEY_TEST | Yes | Not executed [3]
ST_BT_WLAN_COEXISTENCE_TEST | No | Not executed [3]
ST_SECURITY_TEST | Yes | Not executed [3]
ST_HOOKINT_TEST | No | Not executed [3]
ST_BTEMP_TEST | No | Not executed [3]
ST_DVBH_TEST | No | Passed [0]
ST_EXT_DEVICE_TEST | No | Not executed [3]
ST_LCD_CONTROLLER_TEST | No | Not executed [3]
Initialize
Details
Unselect All
Select All
Start
Close
Help
Ready
V 05wk50_pr , 20-12-05 , RM-100 , (c) Nokia.
/ V 1.17.6 05wk51 , 21-12-05 , RM-

5. Follow the **DVB-H troubleshooting flowchart**.

Table 13 Pass/Fail Failure codes

Result	Description	Action
0x1	Self test failed.	Replace DVB-H Module.
0xFD(-3)	No connection to DVB-H Module.	-
0xF2(-14)	Another test is ongoing.	Restart the phone and run the self test again.

DVB-H RF test measurement

Radiated DVB-H RF test measurement with Willtek 4403 universal coupler

Note: Setup: PC/Phoenix + Willtek 4403 universal coupler + signal generator + battery cover attached to phone

Steps

1. Setup the connection as shown in the figure below.

Note: CMU

Copyright © 2008 Nokia. All rights reserved.

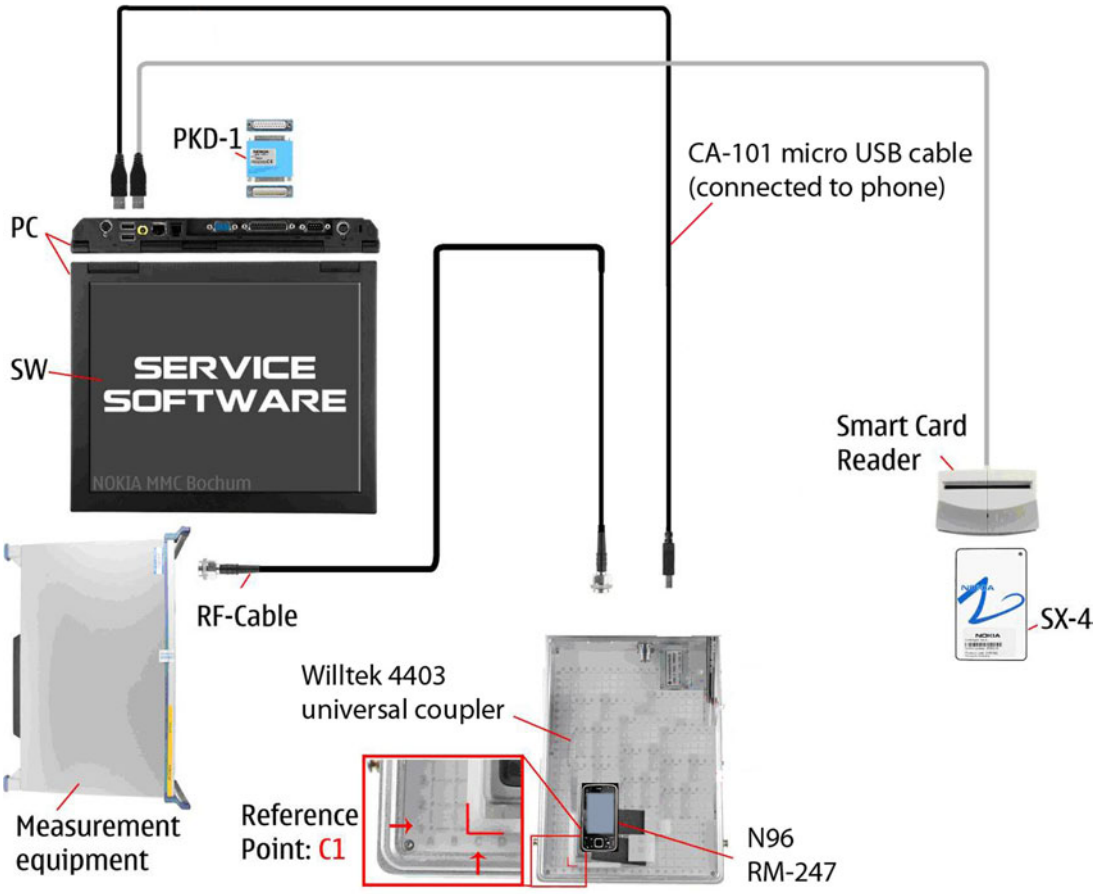
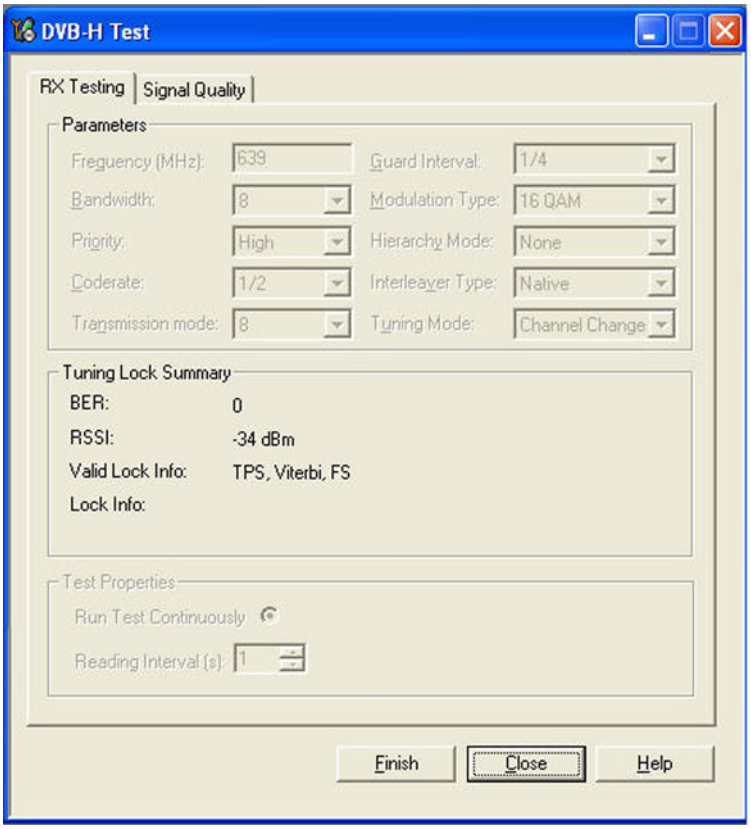


Figure 39 DVB-H RF test measurement setup

2. Make sure connection between PC and phone is alive. Control phone via USB and change operation mode to **LOCAL**.
3. Set the frequency in the signal generator to 639 MHz.
4. Set the output level (amplitude) of the signal generator to -30 dBm.
5. Set the frequency in the RX Testing field in Phoenix to 637 MHz (test window shown in figure below).
6. Press the start button.

Copyright © 2008 Nokia. All rights reserved.

7. Monitor the RSSI value in the Tuning Lock Summary field (see figure below).



8. CW test result > **RSSI reading** > The RSSI value should be within limits given in the following table.

   Note: CW test result > RSSI reading ("Signal Quality" feature is not needed).

Table 14 Setup and target test values

Frequency	Signal level	RSSI value	Tolerance
637	-30 dBm	-53dBm	+/-3dBm

Note: Frequency in the table is typed in DVB-H Test/Frequency field. Set signal generator frequency always 1 MHz higher.

Galvanic DVB-H RF test measurement with FS-51

Note: Setup: PC/Phoenix/FLS-5/SS-46/FS-51 with integrated galvanic RF/SMA connector + signal generator

Copyright © 2008 Nokia. All rights reserved.

Steps

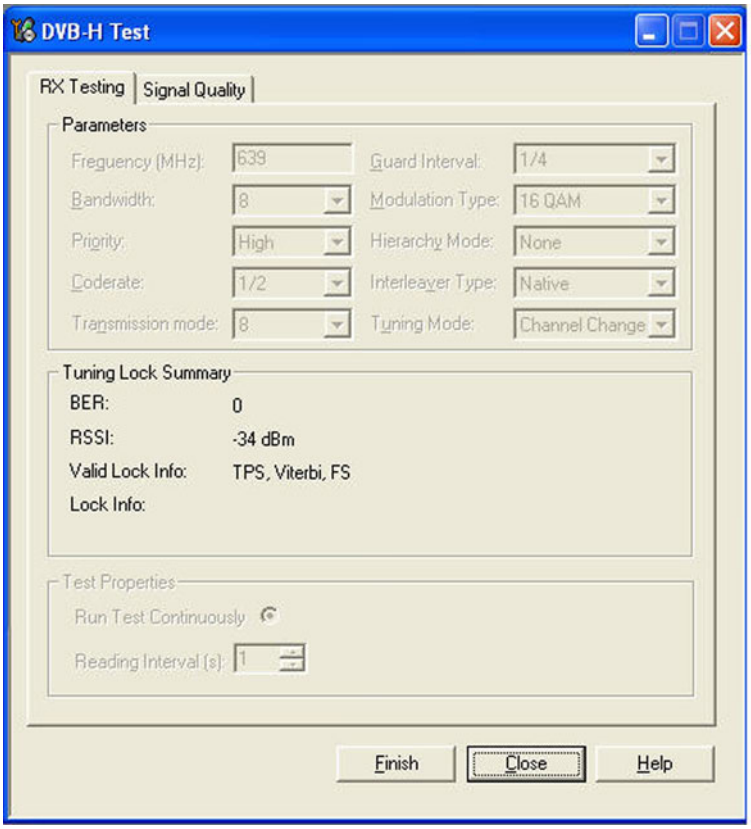
1. Setup the FS-51 with connector and generator.

Figure 40 Setup of FS-51 with connector and signal generator

2. Set the frequency in the signal generator to 639 MHz.
3. Set the output level (amplitude) of the signal generator to -30 dBm.
4. Set the frequency in the RX Testing field in Phoenix to 637 MHz (test window in the following figure).
5. Press the start button.

Copyright © 2008 Nokia. All rights reserved.

6. Monitor the RSSI value in the Tuning Lock Summary field (see figure below).



7. CW test result > **RSSI reading** > The RSSI value should be within limits given in the following table.

   Note: CW test result > RSSI reading ("Signal Quality" feature is not needed).

Table 15 Setup and target test values

Frequency	Signal level	RSSI value	Tolerance
637	-30 dBm	-45dBm	+/-3dBm

Note: Frequency in the table is typed in DVB-H Test/Frequency field. Set signal generator frequency always 1 MHz higher.

Galvanic DVB-H RF test measurement with module jig

Steps

1. Disassemble the phone.

Copyright © 2008 Nokia. All rights reserved.

2. Place disassemble phone to module jig.

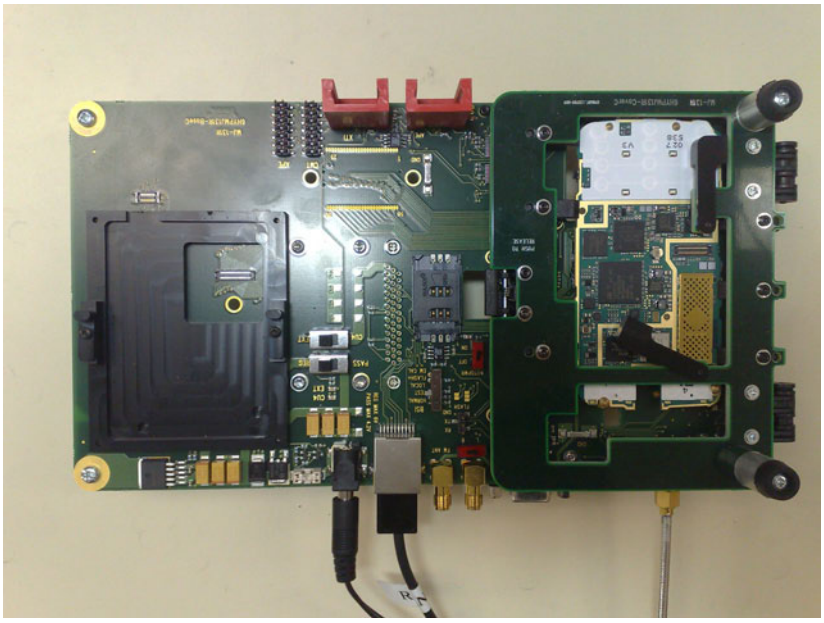


Figure 41 Phone disassembled and placed to jig

3. Connect cables to the jig.
4. Connect cable from **Signal Generator** to **Module Jig DVB-H SMA connector**.
5. Proceed the steps 2-7 according to chapter RM-247 Galvanic DVB-H RF test measurement with FS-51 (page 6–8).

Frequency	Signal level	RSSI value	Tolerance
639	-30 dBm	-33 dBm	+/-3 dBm

DVB-H engine R5 measurement guide

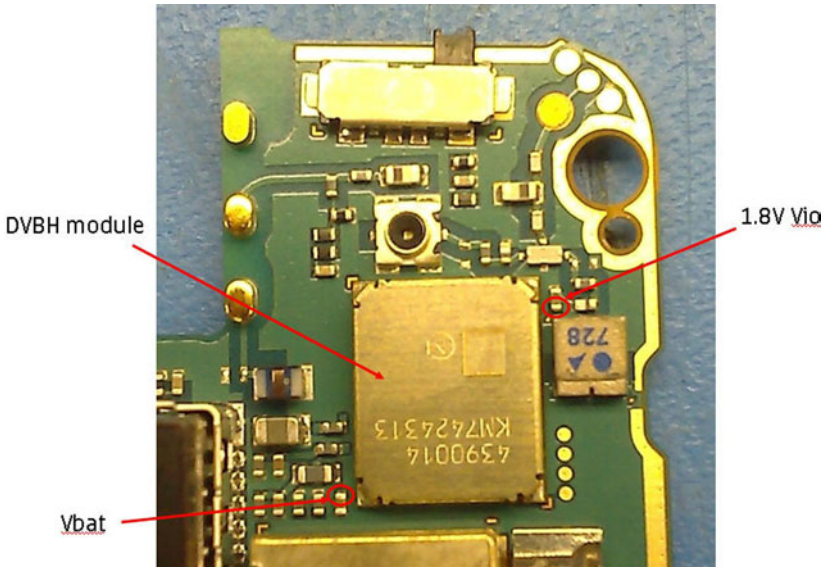


Figure 42 DVB-H module

Copyright © 2008 Nokia. All rights reserved.

Vbat

- should be 3.0 ... 4.2V
- in module jig it should be 3.7V
- in case the voltage is not within limits, there is a ‘general’ failure, short circuit etc. somewhere in the phone

1.8V Vio

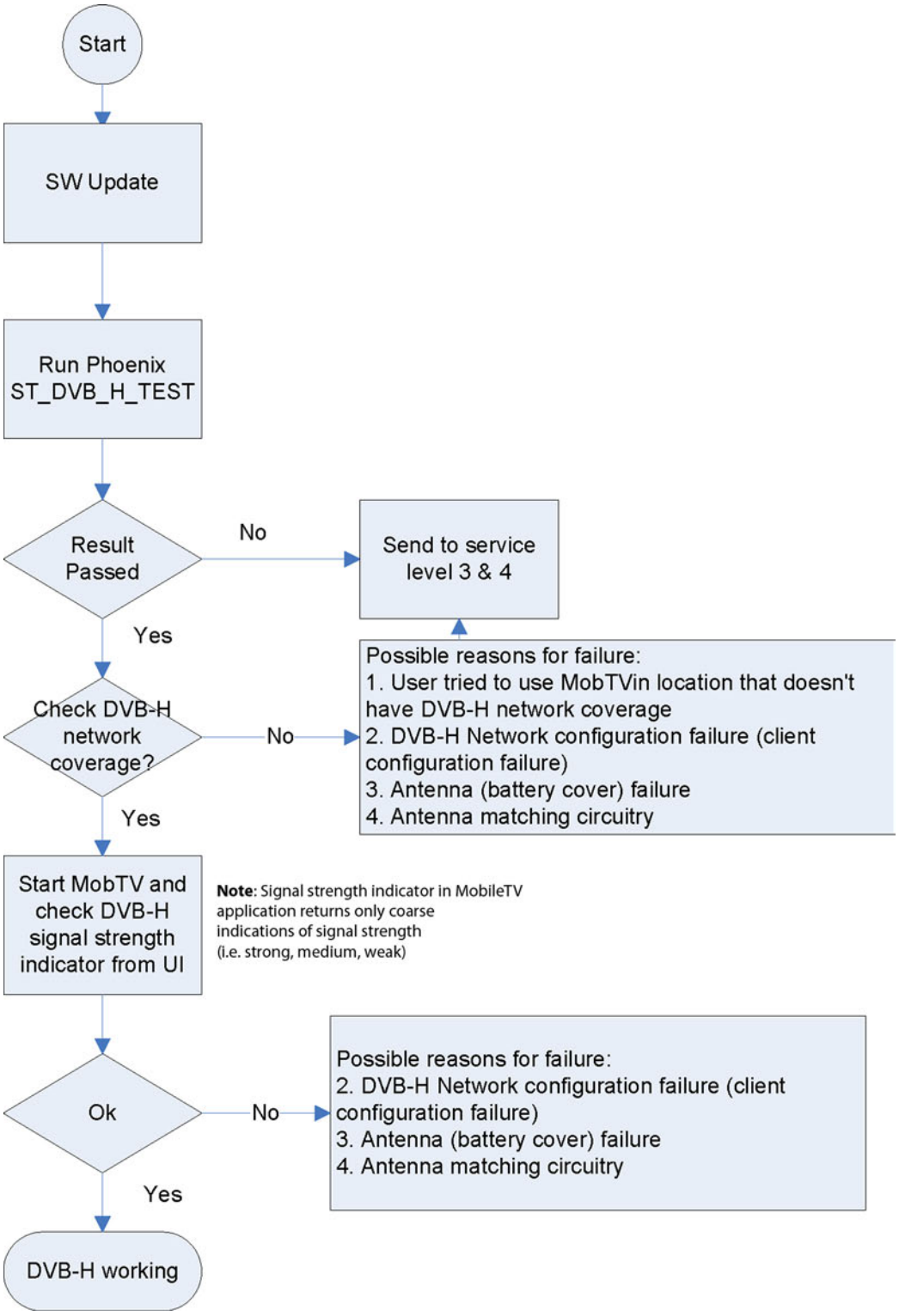
- supplied by ASIC
- should be about 1.8 V (+/- 10%)
- if missing, general failure in phone

Copyright © 2008 Nokia. All rights reserved.

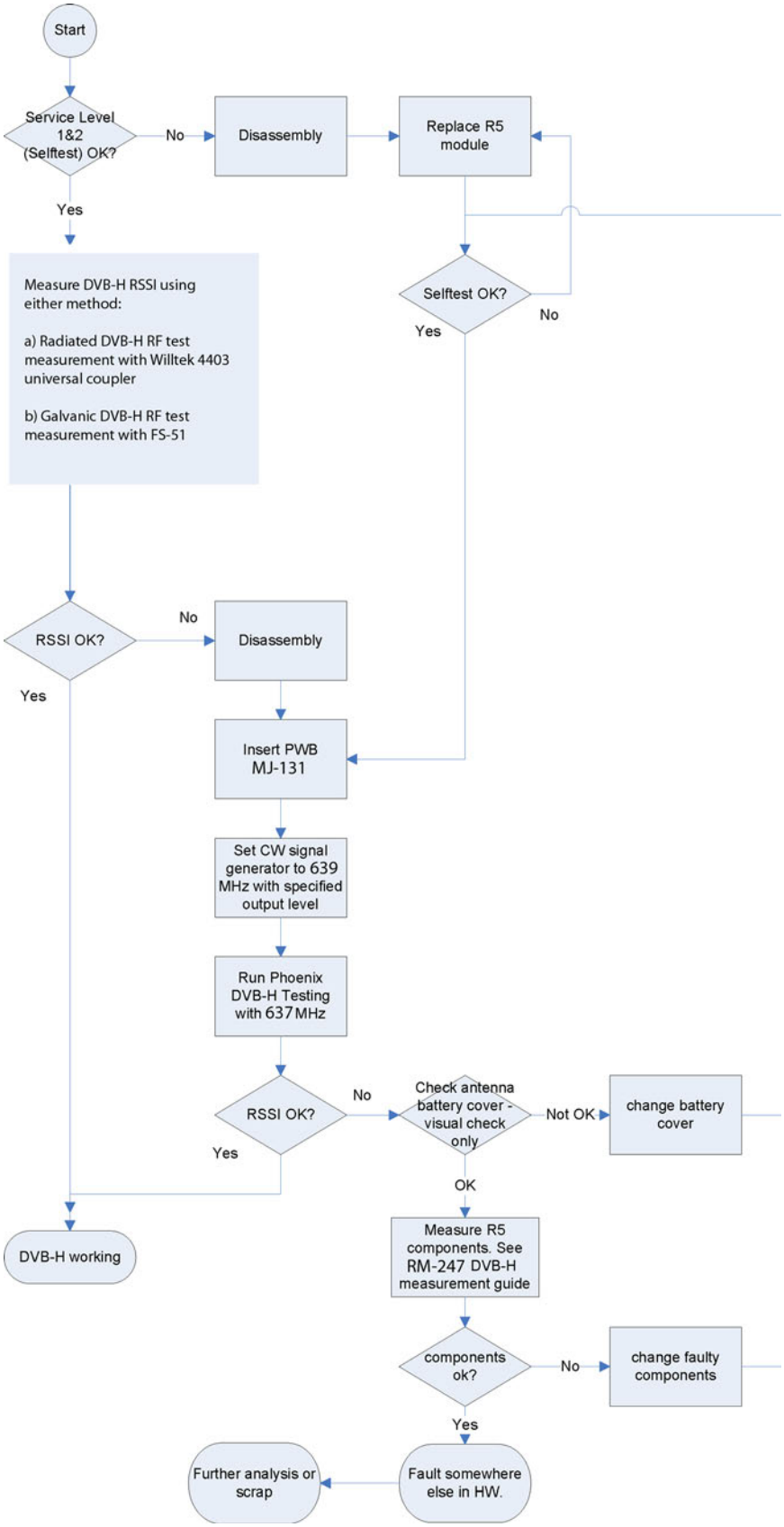
DVB-H troubleshooting

DVB-H troubleshooting

Troubleshooting flow


Start
SW Update
Run Phoenix ST_DVB_H_TEST
Result Passed
No
Send to service level 3 & 4
Yes
Possible reasons for failure:
1. User tried to use MobTVin location that doesn't have DVB-H network coverage
2. DVB-H Network configuration failure (client configuration failure)
3. Antenna (battery cover) failure
4. Antenna matching circuitry
Check DVB-H network coverage?
No
Yes
Start MobTV and check DVB-H signal strength indicator from UI
Note: Signal strength indicator in MobileTV application returns only coarse indications of signal strength (i.e. strong, medium, weak)
Ok
No
Possible reasons for failure:
2. DVB-H Network configuration failure (client configuration failure)
3. Antenna (battery cover) failure
4. Antenna matching circuitry
Yes
DVB-H working

Copyright © 2008 Nokia. All rights reserved.



Copyright © 2008 Nokia. All rights reserved.

7 — System Module

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Table of Contents

Baseband description 7–5
System module block diagram 7–5
Baseband functional description 7–5
Absolute maximum ratings 7–6
Phone modes of operation 7–6
Power distribution 7–8
Clocking scheme 7–10
Bluetooth and FM radio 7–13
Bluetooth 7–13
FM radio 7–13
Bluetooth and FM radio block diagram 7–14
WLAN 7–14
GPS interface 7–16
High-speed USB 7–17
SIM interface 7–17
Internal mass memory interface 7–18
SD card interface 7–18
TV-out interface 7–19
DVB-H interface 7–20
Battery interface 7–20
Camera interfaces 7–21
Camera system 7–21
Main camera characteristics 7–22
Camera flash 7–23
Flash LED and privacy LED 7–24
Secondary camera characteristics 7–25
Accelerometer 7–25
Audio concept 7–25
Audio HW architecture 7–25
Internal microphone 7–26
External microphone 7–26
Internal earpiece 7–27
Internal speaker 7–27
External earpiece 7–27
AV connector 7–28
User interface 7–29
Display 7–29
Display and keyboard backlight 7–30
Keyboard 7–31
Slide position sensors 7–32
RF description 7–33
Block diagram 7–33
Receiver (RX) 7–33
Transmitter (TX) 7–34
Frequency mappings 7–35
GSM850 frequencies 7–35
EGSM900 frequencies 7–35
GSM1800 frequencies 7–36
GSM1900 frequencies 7–38
WCDMA 2100 Rx frequencies 7–39

Copyright © 2008 Nokia. All rights reserved.

WCDMA 2100 Tx frequencies 7–40
WCDMA VIII (900) frequencies 7–41

List of Tables

Table 16 General WLAN specifications 7–16
Table 17 AUDIOCTRL interface 7–28
Table 18 Pin configuration 7–29

List of Figures

Figure 43 System level block diagram 7–5
Figure 44 Power block diagram 7–8
Figure 45 System power-up sequence 7–10
Figure 46 Clocking diagram 7–12
Figure 47 Bluetooth and FM radio block diagram 7–14
Figure 48 WLAN block diagram 7–15
Figure 49 Block diagram of the GPS system 7–16
Figure 50 Block diagram of high-speed USB connection 7–17
Figure 51 SIM interface 7–17
Figure 52 eMMC block diagram 7–18
Figure 53 Pre-warning signal 7–19
Figure 54 Block diagram of TV-out connection 7–20
Figure 55 Camera system block diagram 7–22
Figure 56 Camera flash circuit 7–23
Figure 57 Driver IC on main PWB (top side) for Flash LEDs & privacy LED 7–24
Figure 58 Spring connector (X1401) on main PWB (bottom side) for Flash LEDs & privacy LED 7–24
Figure 59 PWB of Flash LEDs & privacy LED, installed on the B-cover 7–25
Figure 60 Audio block diagram 7–26
Figure 61 Internal microphone 7–26
Figure 62 Internal earpiece schematics 7–27
Figure 63 Stereo IHF connection 7–27
Figure 64 AV connector component layout and pads 7–28
Figure 65 Connector pin layout (Plug conductors from left to right HS EAR L, HS EAR R, HS MIC/Cntrl. and HS GND) 7–28
Figure 66 Backlight circuitry 7–31
Figure 67 RF block diagram 7–33

Copyright © 2008 Nokia. All rights reserved.

Baseband description

System module block diagram

The device consists of two different main modules: transceiver and UI/slide module. The transceiver board consists of baseband and RF components. The UI/slide module consists of the display, UI-FPC and MM key module. Numeric keyboard is on the system/RF module.

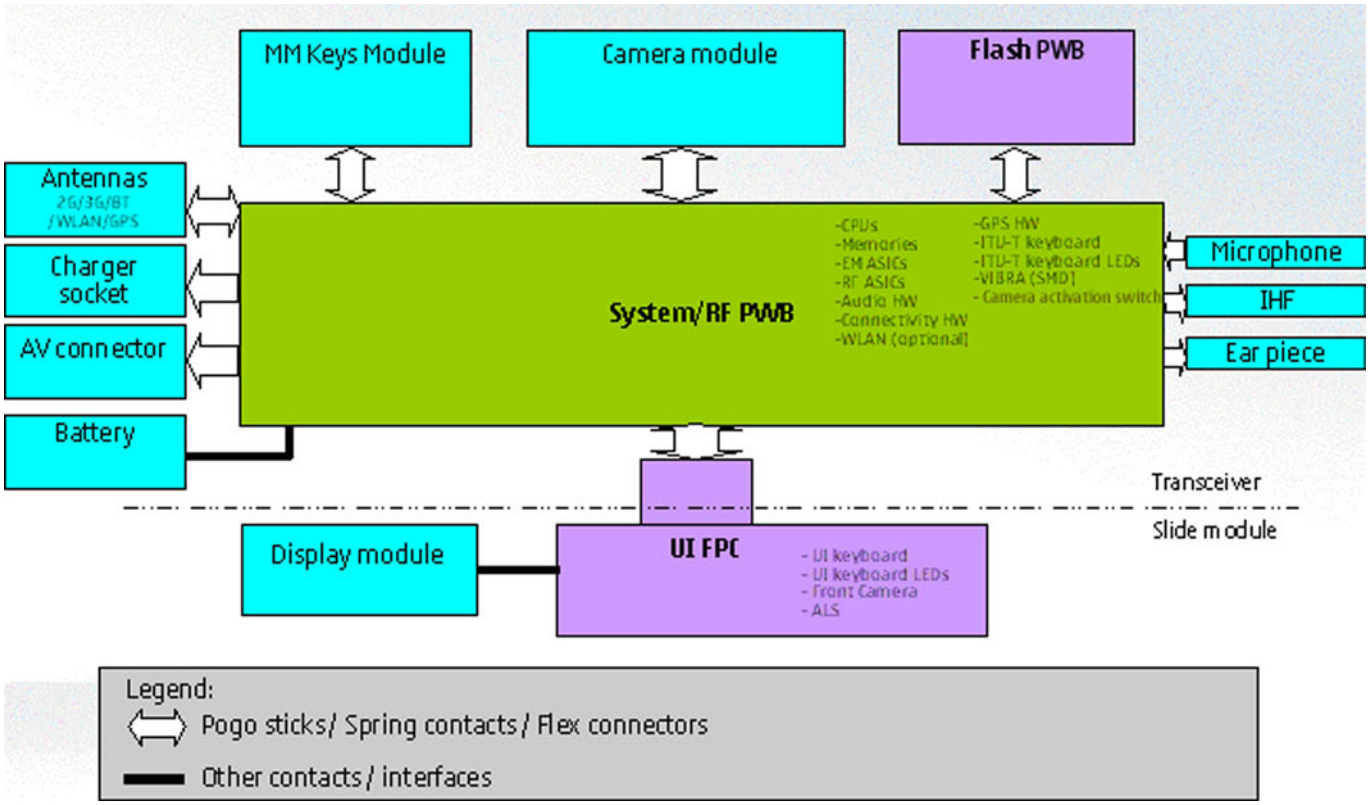


Figure 43 System level block diagram

Baseband functional description

Digital baseband consists of an ISA (Intelligent Software Architecture) based modem and Symbian based application sections. The modem functionality is in RapidoYawe, and the application processor Nomadik 1.5 acts as a platform for Symbian applications.

The cellular modem engine processor is Rapido. Yawe is HSDPA/WCDMA logic IC stacked on top of Rapido ASIC. RapidoYawe supports WCDMA/HSDPA and GSM protocols. RapidoYawe operates with the 38.4MHz system clock, which comes from VCTCXO, and provides 19.2MHz system clock to application processor. Cellular side mixed signal functionality is divided into two ASIC's, Betty and AVilma, and a separate SMPS. Charging control, core voltage regulator and FBUS level shifter are included in Betty; regulators, SIM interface, A/D-converters, RTC and audio interface are included in AVilma. The cellular modem memory is a discrete combo memory 128Mbit NOR Flash and 128Mbit SDRAM.

The application processor ASIC is Nomadik1.5 STn8815. It processes application SW and handles the UI SW. Nomadik1.5 consists of processors, HW accelerators and several I/O peripherals. STn8815S22, the package variant used in this application, includes die-stacked memories in addition to STn8815 die. The memories inside S22 package are 1-Gbit NAND with 16-bit interface and 2x512Mbit Mobile-DDR with 16-bit interface. Application engine mixed signal IC is Touareg1bis, which includes APE I/O power supply, Nomadik1.5 core, PLL and fuses power supplies, auxiliary power supply, MMC/SD card interface and power supply, and I2C interface.

Copyright © 2008 Nokia. All rights reserved.

Absolute maximum ratings

Signal	Min	Nom	Max	Unit	Notes
Battery voltage (idle)	-0.3		+4.5	V	Battery voltage maximum value is specified during active charging
Battery voltage (Call)	+3.2		+4.3	V	Battery voltage maximum value is specified during active charging, defined by SW
Charger input voltage	-0.3		+20	V	
Back-Up supply voltage	0	2.5	2.6	V	Maximum capacity of the backup power supply assumed to be 4 µAh.

Phone modes of operation

Mode	Description
NO_SUPPLY	(Dead) mode means that the main battery is not present or its voltage is too low (below EM ASIC N2200 master reset threshold) and that the back-up battery voltage is too low.
BACK_UP	The main battery is not present or its voltage is too low, but back-up battery voltage is adequate and the 32kHz oscillator is running (RTC is on).
PWR_OFF	In this mode (warm), the main battery is present and its voltage is over EM ASIC N2200 master threshold. All regulators are disabled, PurX is on low state, the RTC is on and the oscillator is on. PWR_OFF (cold) is almost the same as PWR_OFF (warm), but the RTC and the oscillator are off.
RESET	RESET mode is a synonym for start-up sequence. In this mode certain regulators are enabled and after they and RFClk have stabilized, the system reset (PurX) is released and PWR_ON mode entered. RESET mode uses 32kHz clock to count the REST mode delay (typically 16ms).
SLEEP	SLEEP mode is entered only from PWR_ON mode with the aid of SW when the system activity is low. There are in principle three different sleep modes: • Application processor sleep • RAPIDO sleep • Application processor and RAPIDO sleep (deep sleep) In sleep mode N2200's regulators VIO, VDRAM, VSIM1 and VANA are in low quiescent current mode (output voltages still present but regulators will not give as much current out). VSIM2 is permanently off, and VAUX is always in the power on mode. Other regulators including VR1 supplying system clock oscillator are disabled. In SLEEP mode, N2390 VCore SMPS regulator is in low quiescent current mode. In SLEEP mode, N2300 EM ASIC linear regulator VOUT state depends on the accessory connected to the AV connector, if there is any.
FLASHING	FLASHING mode is for SW downloading.

Copyright © 2008 Nokia. All rights reserved.

Voltage limits

Parameter	Description	Value
VMSTR	Master reset threshold (N2200)	2.2V (typ.)
VMSTR+	Threshold for charging, rising (N2300)	2.1V (typ.)
VMSTR-	Threshold for charging, falling (N2300)	1.9V (typ.)
VCOFF+	Hardware cutoff (rising)	2.9V (typ.)
VCOFF-	Hardware cutoff (falling)	2.6V (typ.)
SWCOFF	SW cutoff limit	~3.25V (defined by SW)

The master reset threshold controls the internal reset of EM ASICs. If battery voltage is above VMSTR, N2300 charging control logic is alive. Also, RTC is active and supplied from the main battery. Above VMSTR, N2300 allows the system to be powered on although this may not succeed due to voltage drops during start up. SW can also consider battery voltage too low for operation and power down the system.

Power key

The system boots up, when power key is pressed (adequate battery voltage, VBAT, present).

Power down can be initiated by pressing the power key again (the system is powered down with the aid of SW). Power key is connected to EM ASIC N2200 via PWRONX signal.

Copyright © 2008 Nokia. All rights reserved.

Power distribution

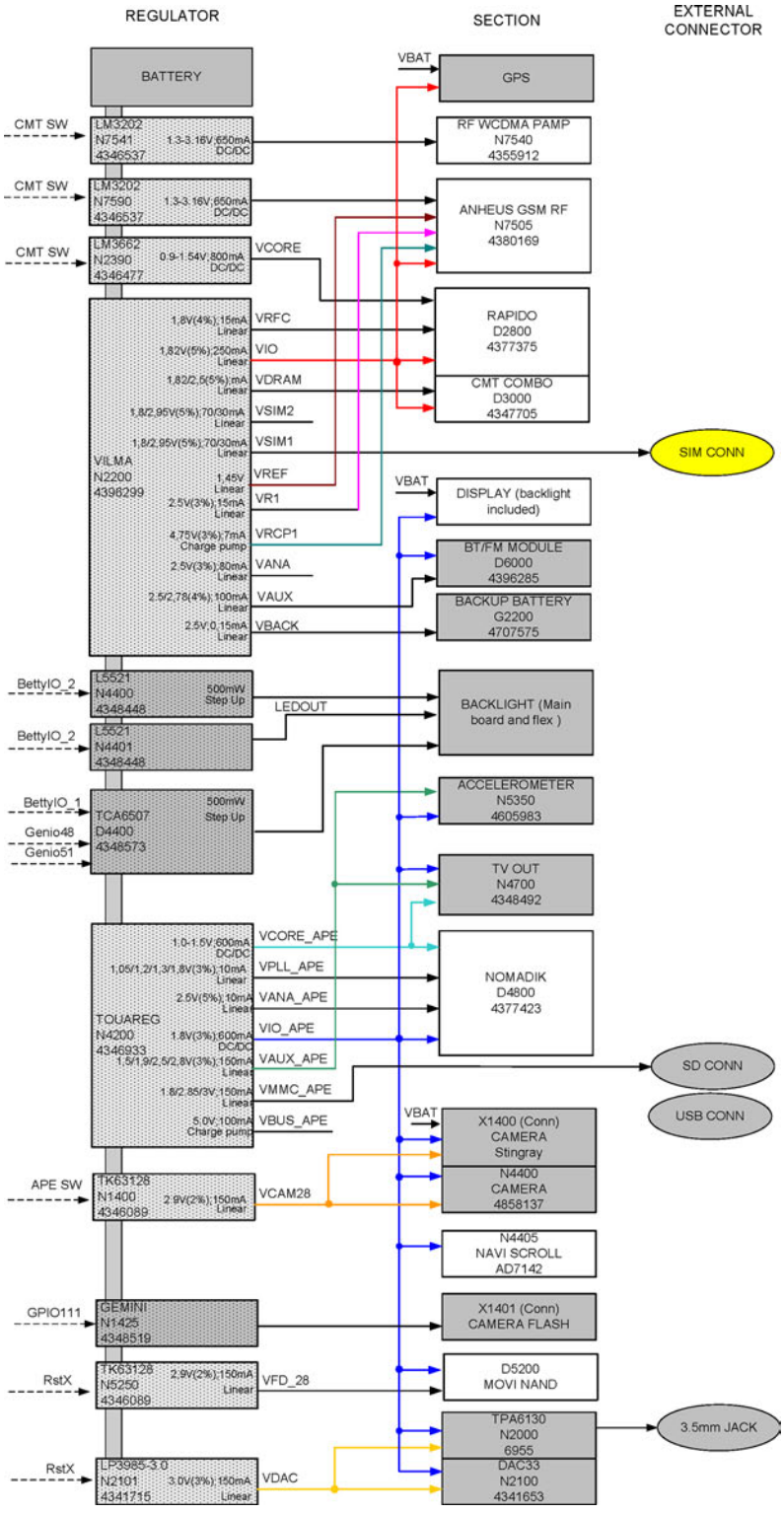


Figure 44 Power block diagram

Copyright © 2008 Nokia. All rights reserved.

System power-up

After inserting the main battery, regulators started by HW are enabled. SW checks, if there is some reason to keep the power on. If not, the system is set to power off state by watchdog. Power up can be caused by following reasons:

- Power key is pressed
- Charger is connected
- RTC alarm occurs
- MBUS wakeup

CellMo engine (WG4.1M) is master during power up sequence i.e. CellMo side makes the decision when phone is powered on. RSTX signal from AVilma is used to enable the startup sequence of Rel3.1 engine. The rising edge of RSTX starts all the resources needed to boot RAPIDOYawe and Nomadik chips.

The actual power-up sequence is shown below.

Copyright © 2008 Nokia. All rights reserved.

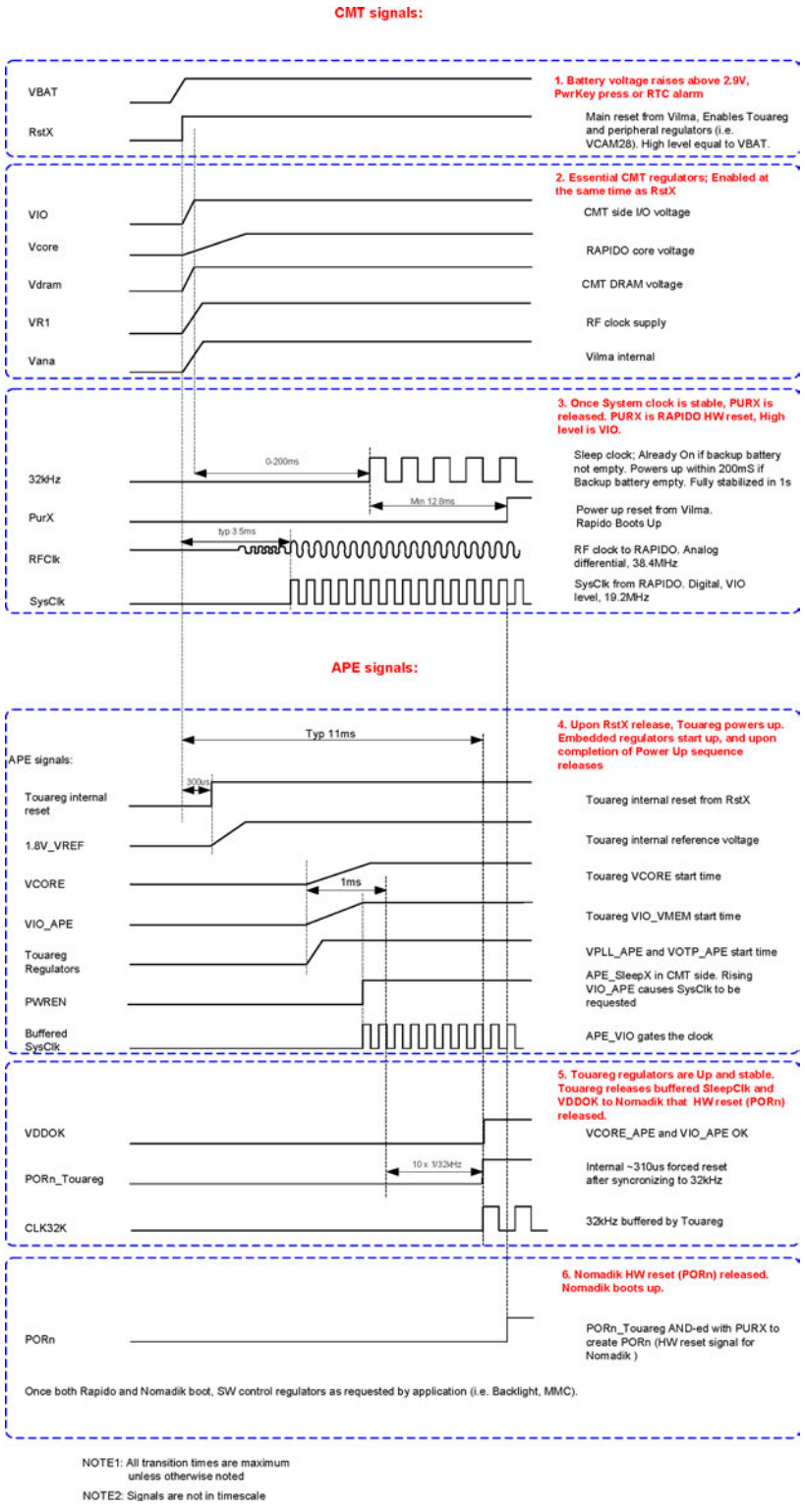

CMT signals:
VBAT
RstX
1. Battery voltage raises above 2.9V, PwrKey press or RTC alarm
Main reset from Vilma, Enables Touareg and peripheral regulators (i.e. VCAM28). High level equal to VBAT.
2. Essential CMT regulators; Enabled at the same time as RstX
VIO
Vcore
Vdram
VR1
Vana
CMT side I/O voltage
RAPIDO core voltage
CMT DRAM voltage
RF clock supply
Vilma internal
3. Once System clock is stable, PURX is released. PURX is RAPIDO HW reset, High level is VIO.
32kHz
PurX
RFClk
SysClk
0-200ms
Min 12.8ms
typ 3.5ms
Sleep clock; Already On if backup battery not empty. Powers up within 200mS if Backup battery empty. Fully stabilized in 1s
Power up reset from Vilma. Rapido Boots Up
RF clock to RAPIDO. Analog differential, 38.4MHz
SysClk from RAPIDO. Digital, VIO level, 19.2MHz
APE signals:
Typ 11ms
APE signals:
Touareg internal reset
1.8V_VREF
VCORE
VIO_APE
Touareg Regulators
PWREN
Buffered SysClk
1ms
4. Upon RstX release, Touareg powers up. Embedded regulators start up, and upon completion of Power Up sequence releases
Touareg internal reset from RstX
Touareg internal reference voltage
Touareg VCORE start time
Touareg VIO_VMEM start time
VPLL_APE and VOTP_APE start time
APE_SleepX in CMT side. Rising VIO_APE causes SysClk to be requested
APE_VIO gates the clock
5. Touareg regulators are Up and stable. Touareg releases buffered SleepClk and VDDOK to Nomadik that HW reset (PORn) released.
VDDOK
PORn_Touareg
CLK32K
10 x 1/32kHz
VCORE_APE and VIO_APE OK
Internal ~310us forced reset after syncronizing to 32kHz
32kHz buffered by Touareg
6. Nomadik HW reset (PORn) released. Nomadik boots up.
PORn
PORn_Touareg AND-ed with PURX to create PORn (HW reset signal for Nomadik)
Once both Rapido and Nomadik boot, SW control regulators as requested by application (i.e. Backlight, MMC).
NOTE1: All transition times are maximum unless otherwise noted
NOTE2: Signals are not in timescale

Figure 45 System power-up sequence

Clocking scheme

There are two main clocks in the system:

- 38.4MHz RF clock produced by VCTCXO in RF section
- 32.768kHz sleep clock produced by the EM ASIC AVILMA (N2200) with an external crystal.

RF clock is generated only when VCTCXO is powered on by the EM ASIC regulator. The regulator itself is activated by SleepX signal from RAPIDOYawe (D2800). When both CPU's are on sleep, RF clock is stopped.

Copyright © 2008 Nokia. All rights reserved.

RF clock is used by RAPIDOYawe, which provides 19.2MHz SysClk to the application processor. Both RAPIDOYawe and Nomadik have internal PLL's that create clock signals for other peripheral devices/interfaces like SD card, SIM, CCP, I2C and memories.

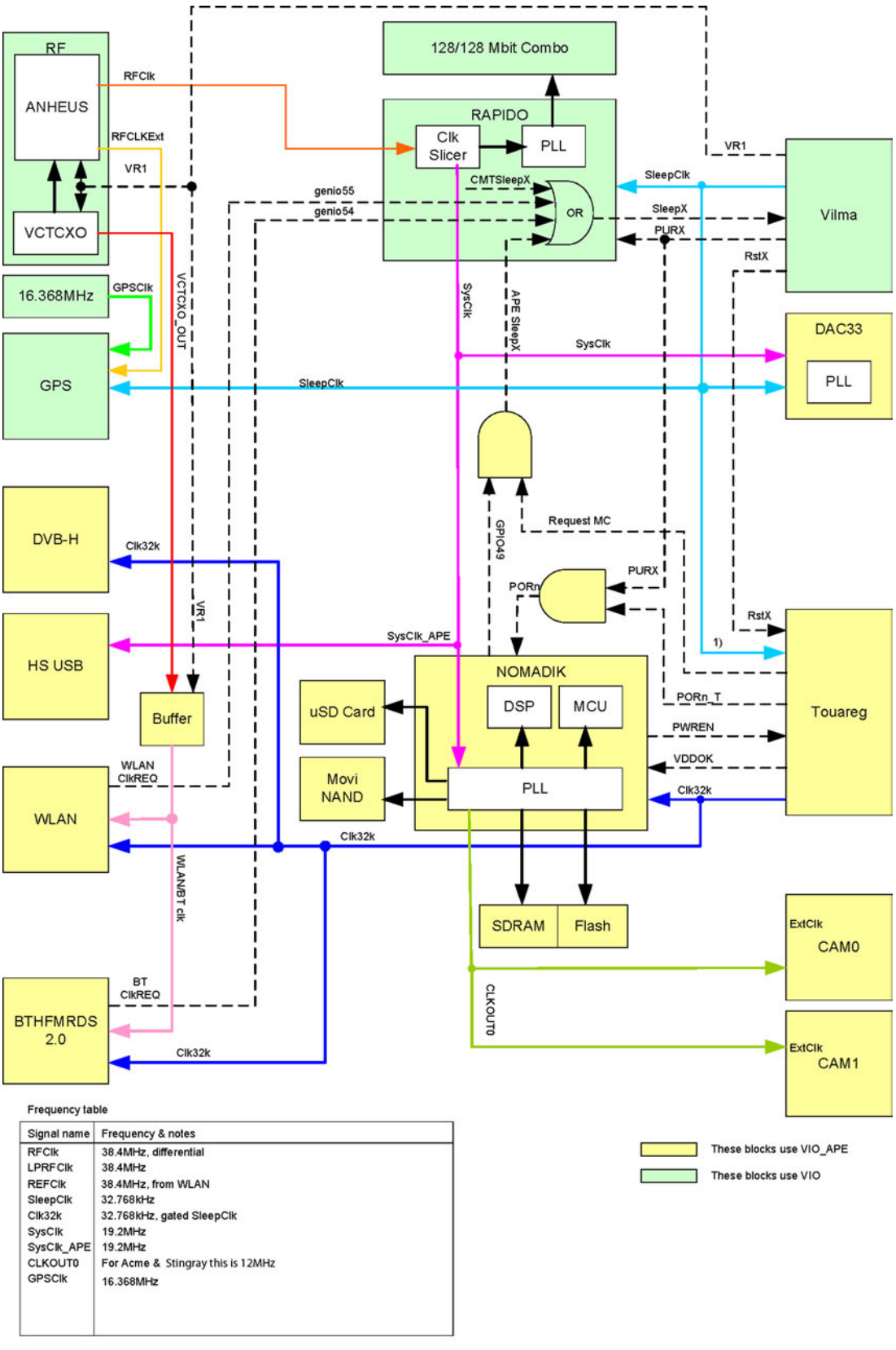
BT and WLAN have their own 38.4MHz crystal oscillator that generates clock signal when clock request from either WLAN or BT is high.

32k Sleep Clock is always powered on after startup. Sleep clock is used by RAPIDOYawe and Nomadik application processor for low power operation. Sleep clock is also used by GPS, FM Radio, Bluetooth and WLAN. For RAPIDOYawe and GPS the sleep clock is not buffered, for other modules the sleep clock is buffered (VIO_APE is the buffer power supply).

SMPS Clk is a 2.4MHz clock line from RAPIDOYawe to EM ASIC Betty (N2300) and discrete SMPS N2390. In deep sleep, when VCTCXO is off, this signal is set to '0' state.

12 MHz Camera Clock is generated by Nomadik.

Copyright © 2008 Nokia. All rights reserved.



Frequency table

Signal name	Frequency & notes
RFClk	38.4MHz, differential
LPRFClk	38.4MHz
REFClk	38.4MHz, from WLAN
SleepClk	32.768kHz
Clk32k	32.768kHz, gated SleepClk
SysClk	19.2MHz
SysClk_APE	19.2MHz
CLKOUT0	For Acme & Stingray this is 12MHz
GPSClk	16.368MHz

1) The SleepClk is gated inside Touareg because APE and CMT use separate IO power rails and VIO_APE is powered after VIO.

Figure 46 Clocking diagram

Copyright © 2008 Nokia. All rights reserved.

Bluetooth and FM radio

Bluetooth

The BTHFMRDS2.0M module, D6000, is integrated with some discrete passive components, band-pass filter and the BCM2048 Bluetooth ASIC which also includes the FM radio. See the FM radio description in the next section. The Bluetooth (BT) transceiver provides a wireless digital communication link between a master unit and up to seven slave units.

The BT module shares the system clock signal (38.4MHz) from the Ritsa engine, through a clock buffer, V7400. The BT audio interfaces are connected to the Rapido's (D2800) PCM ports, while its data links are through the application CPU's (D4800) UART ports. BT's RF input/output path is connected to the WLAN Front End Module (FEM), so the BT operation can coexist with the WLAN's, with BT-WLAN-coexisting control lines connected between two ASICs.

FM radio

The FM radio is integrated together with the Bluetooth on the BCM2048 ASIC. The Murata module used is a single module solution which contains the BCM2048 ASIC and all external passive components. The FM radio is controlled by the RAPIDO-YAWE (D2800) via the FCI_CMT I2C bus. It utilizes the AV connector for its antenna connectivity. The RF input of the FM module is connected to the right-side-audio output pin of the AV connector via a RF coupling circuitry. The headset wire acts as the antenna for FM reception. The stereo FM audio outputs are fed to the headset after going through the DAC33 (N2100) and the TPA6130 headset amplifier (N2000). RDS data is also available from this BCM2048 ASIC via the I2C bus.

Copyright © 2008 Nokia. All rights reserved.

Bluetooth and FM radio block diagram

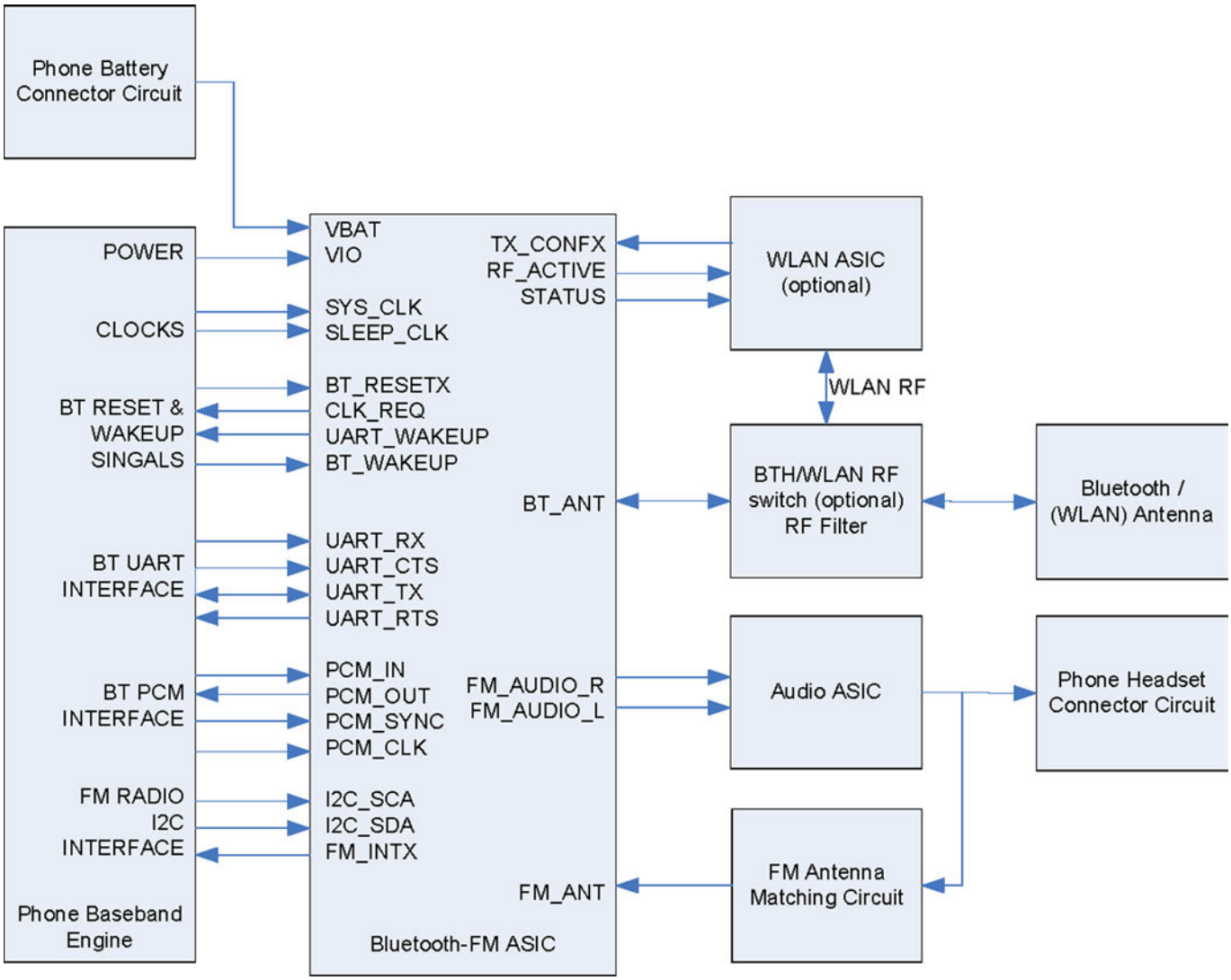


Figure 47 Bluetooth and FM radio block diagram

WLAN

WLAN engine is divided into STLC4560 WLAN transceiver module and radio front-end module (FEM) RF5924.

STMicroelectronics Phaser STLC4560 is a three-die multichip module, partitioned to radio, baseband and energy management die. STLC4560 is packaged to 8.5 mm x 8.0 mm x 1.4 mm 240-ball 0.5 mm pitch LFBGA.

STLC4560 implements 802.11b/g WLAN radio for embedded, low-power and small form factor mobile applications. STLC4560 conforms to the IEEE 802.11b/g protocols operating in 2.4 GHz band supporting OFDM data rates of 54, 48, 36, 24, 18, 12, 9, and 6 Mbps as well as CCK data rates of 11 and 5.5 Mbps and legacy data rates of 2 and 1 Mbps. IEEE802.11e/i protocol extensions are included to implement quality of service (QoS) and security functions.

STLC4560 has a fully integrated radio chip including a direct-conversion transceiver, RF synthesizer and VCO, and high-speed data converters. Digital interface is used for transferring the sampled data between radio and baseband chip. The baseband chip implements OFDM/CCK digital baseband processor and ARM9- based MAC with internal SRAM memories. The baseband includes required logic and interfaces to enable time-shared simultaneous use of BT and WLAN.

Copyright © 2008 Nokia. All rights reserved.

The energy management unit integrates required power management functions to operate the system from VBAT (3.0 – 5.5 V). The EM unit generates 1.2 V digital core voltage, two 1.8 V supplies for RF and 2.8 V LDO for PA bias supply. The EM unit also integrates power-on reset circuitry and level-shifters for RF front-end GaAs switches.

Host interface is provided by a flexible serial interface (SPI) supporting clock frequency upto 48 MHz. The maximum usable SPI clock rate depends on the host side clocking options and timing requirements. Typically rates of 14 – 24 MHz are achieved. WLAN/BT coexistence interface enables automatic time shared usage of WLAN and Bluetooth.

WLAN and Bluetooth systems use the same 38.4-MHz reference clock from Ritsa engine. The output signal from Ritsa's TCVCXO was tapped and buffered by a discrete clock buffer (V7400) and connected to WLAN and BT's reference clock inputs. Low power sleep mode or energy management stand-by state is enabled by using 32768-Hz speed clock.

WLAN RFMD RF5924 front end module is used. Power amplifier, RF-switches and baluns are integrated to FEM. The PA includes power detector for closed-loop power control purposes. WLAN/BT bandpass filter is external ceramic filter.

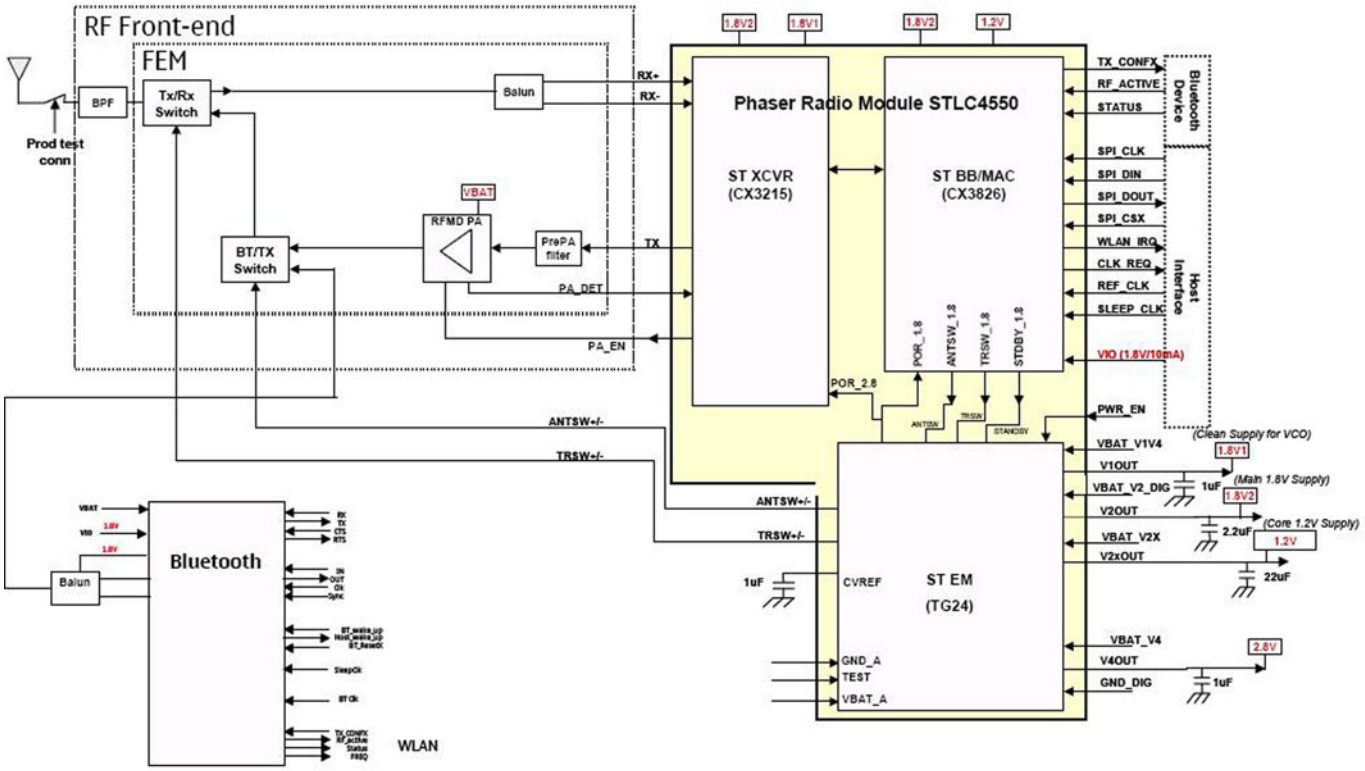


Figure 48 WLAN block diagram

Copyright © 2008 Nokia. All rights reserved.

Table 16 General WLAN specifications

Supported channels	USA 1-11 (2412-2462MHz) ETSI 1-13 (2412-2472MHz)
Transmitter power Barker/CCK (1, 2, 5.5, 11Mbps datarate) OFDM-BPSK(6, 9 Mb/s) OFDM-QPSK(12,18 Mb/s) OFDM-16QAM (24, 36 Mb/s) OFDM-64QAM (48,54 Mb/s)	16dBm 14dBm 14dBm 12dbm 12dBm
Power control range	0-16dBm
Receiver sensitivity (typical) 11M/bits. 1024bytes / 8% PER 54 Mb/s, 1000 bytes, 10% PER	-83dBm -70dBm

GPS interface

The device includes an inbuilt GPS receiver and it works as a stand-alone positioning device. The antenna is located on the top right corner on the bottom side of the product.

The GPS system is connected to RAPIDO ASIC.

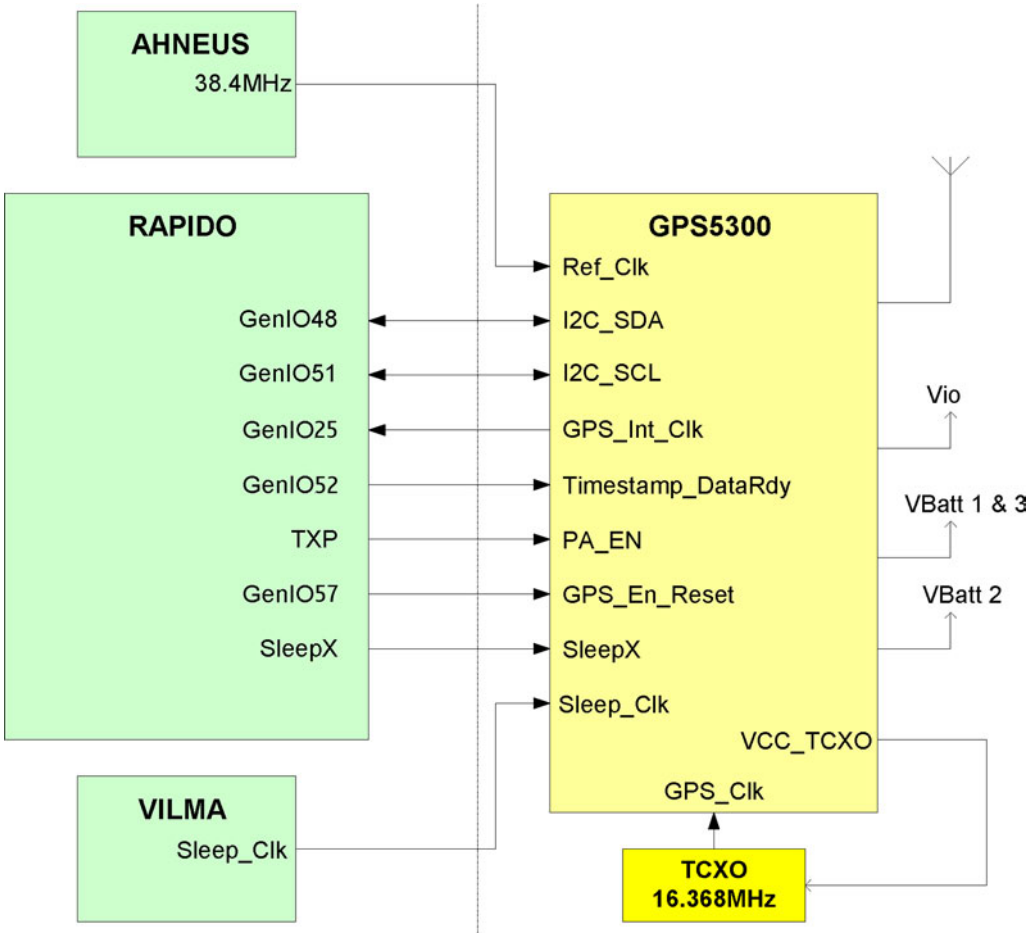


Figure 49 Block diagram of the GPS system

Copyright © 2008 Nokia. All rights reserved.

High-speed USB

The device can transmit and receive USB data at high-speed (480 Mbit/s), full-speed (12 Mbit/s) and low-speed (1.5Mbit/s). The USB connection is implemented using D5300 ULPI high-speed USB transceiver and the ULPI interface from Application IC D4800. ULPI (UTMI low pin interface) is a 12-pin interface standard for connecting USB core logic to a USB transceiver. External interface is the USB-B connector. The interface between D5300 USB transceiver and USB connector is a standard USB interface specified in Universal Serial Bus specification Rev. 2.0. The USB transfers signal and power over four-wire interface, which carries differential data, Vbus and GND. Signalling occurs over differential data line D+ and D-. The clock is transmitted encoded along with the differential data. ESD protection is done with USB ASIP V5300. VBUS (+5V) is provided by the host device.

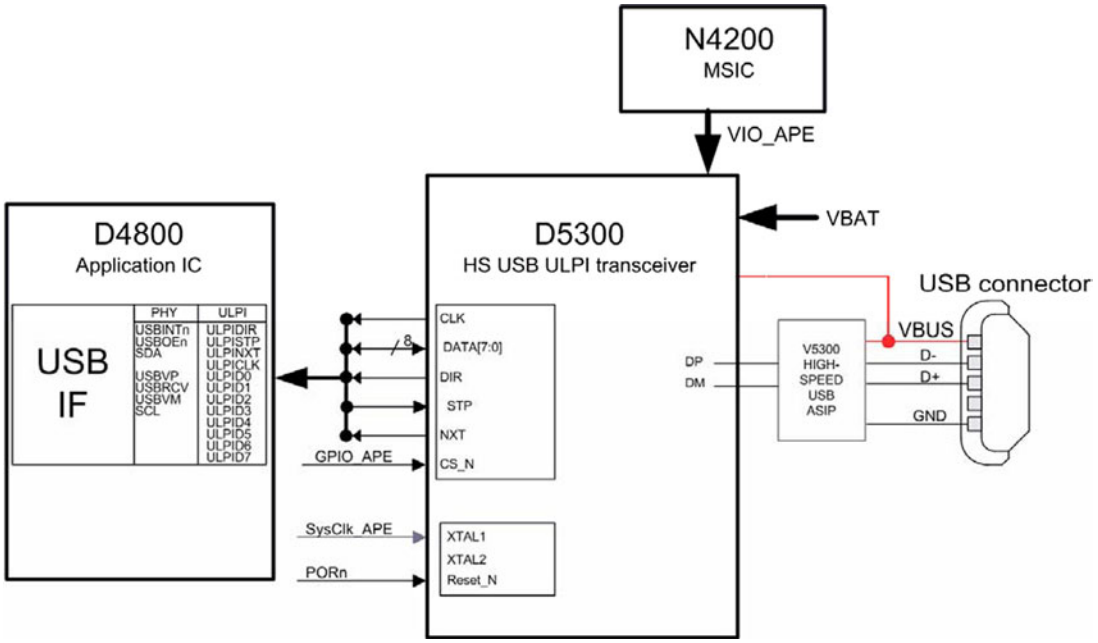


Figure 50 Block diagram of high-speed USB connection

SIM interface

The SIM (Subscriber Identification Module) interface is located in two ASICs; Cellular Modem ASIC D2800 contains most of the interface functionality and the mixed signal ASIC N2200 takes care of power up/down, card detect, ATR counting and level shifting. ESD protection components are integrated to N2200 ASIP.

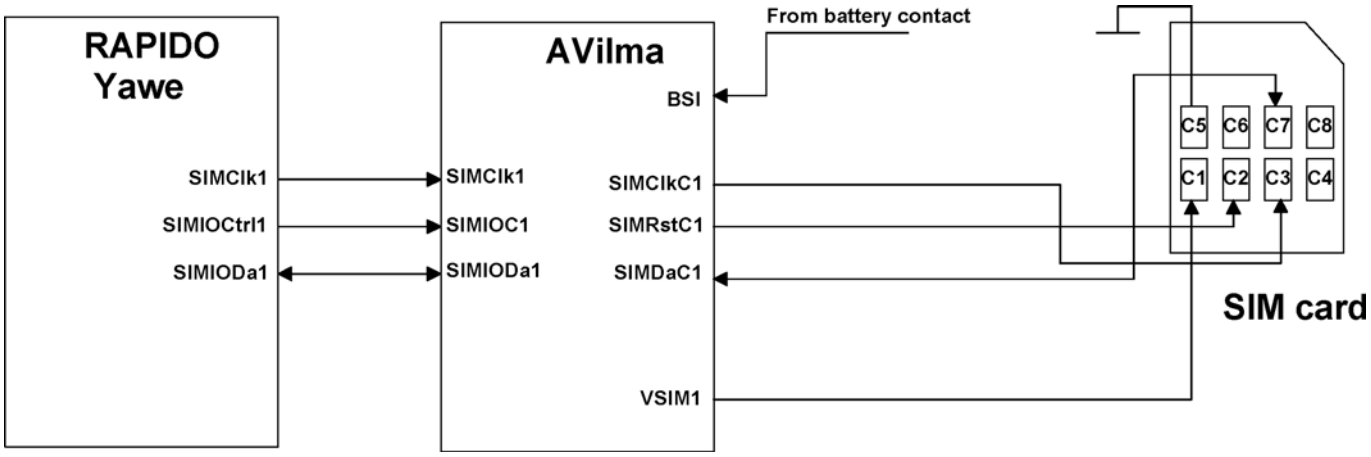


Figure 51 SIM interface

Copyright © 2008 Nokia. All rights reserved.

Internal mass memory interface

Internal mass memory called eMMC is a BGA-packaged FLASH with HS-MMC interface. The eMMC memory interface is compliant with the MultiMediaCard Specification version 4.2. The host in the eMMC interface is application ASIC D4800 (Nomadik1.5). A Dual MMC Architecture Interface has been implemented on Nomadik 1.5, which is includes a microSD card, and an Embedded eMMC.

Both of them are connected to the Nomadik's SD/MMC/SDIO interface A memory selection has been done through the Command line multiplexing which is controlled by GPIO23.

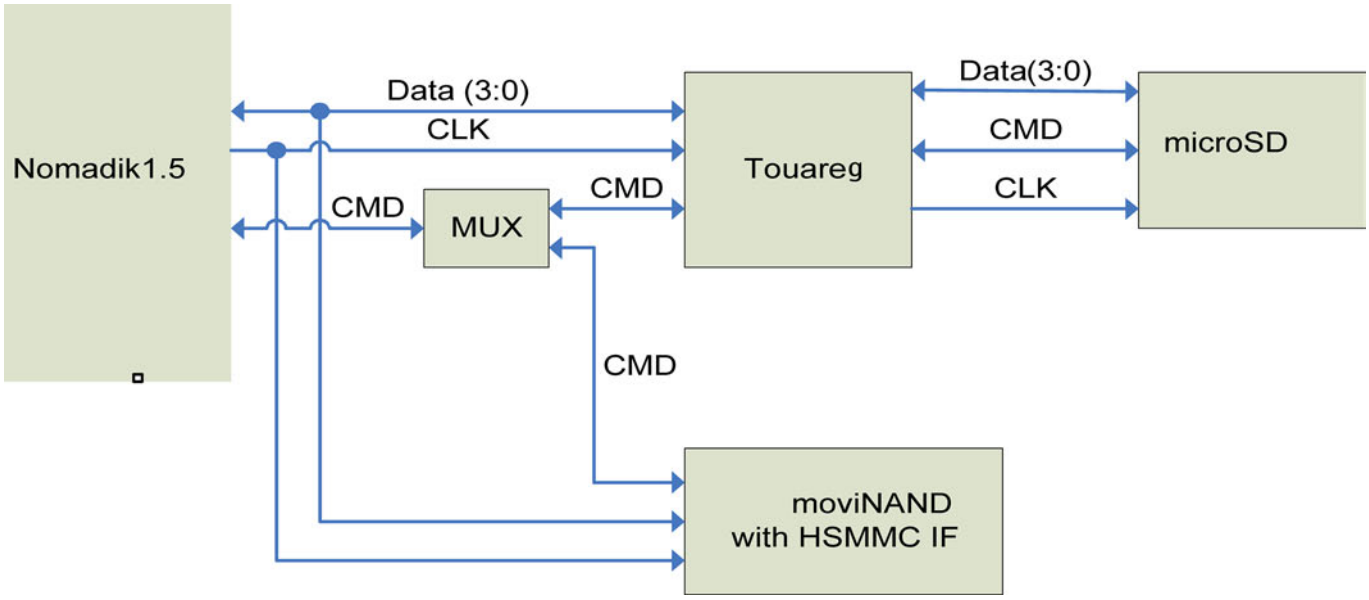


Figure 52 eMMC block diagram

SD card interface

Memory card interface is compliant with the MultiMediaCard Specification version 4.x, the SD Memory Card Specification, Physical Layer Specification version 2.00 and Secure Digital Input/Output Card Specification, Version 1.20.

A Dual MMC Architecture Interface has been implemented on Nomadik 1.5, which is includes a microSD card, and an Embedded eMMC. Both of them are connected to the Nomadik's SD/MMC/SDIO interface A memory selection has been done through the Command line multiplexing which is controlled by GPIO23.

The host in the SD card interface is application ASIC D4800. SD card transceiver/level shifter is built in Touareq IC (N4200). There are four data signals, one command signal and a clock output signal going in N4200. For transceiver control, there are direction signals to each data signals and one also for CMD. A feedback clock is coming from transceiver to host. Clock frequency used is 12 MHz (TBD later). ESD protection is implemented with an ESD ASIP, R5200.

Hot-Swap

To enable Hot-Swap of the micro SD card, the device uses an SD card connector with a pre-warning signal.

To enable card removal, the user needs to push SD-card further in to the connector first. This gives so-called pre-warning signal to the system and ongoing write/read operation can be finished safely before card isremoved. Note that this is just a backup mechanism and does not cover all the use cases (writing/ readinglarge amount of data): the user should always complete the write operation before starting the card removal.

Copyright © 2008 Nokia. All rights reserved.

This microSD Card Connector has a Hot-Swap Switch 1 for the Card presence detection. It's connected to the GPIO 113. Switch 2 is a pre-warning switch for safe removal of microSD card, which is connected to the GPIO 16.

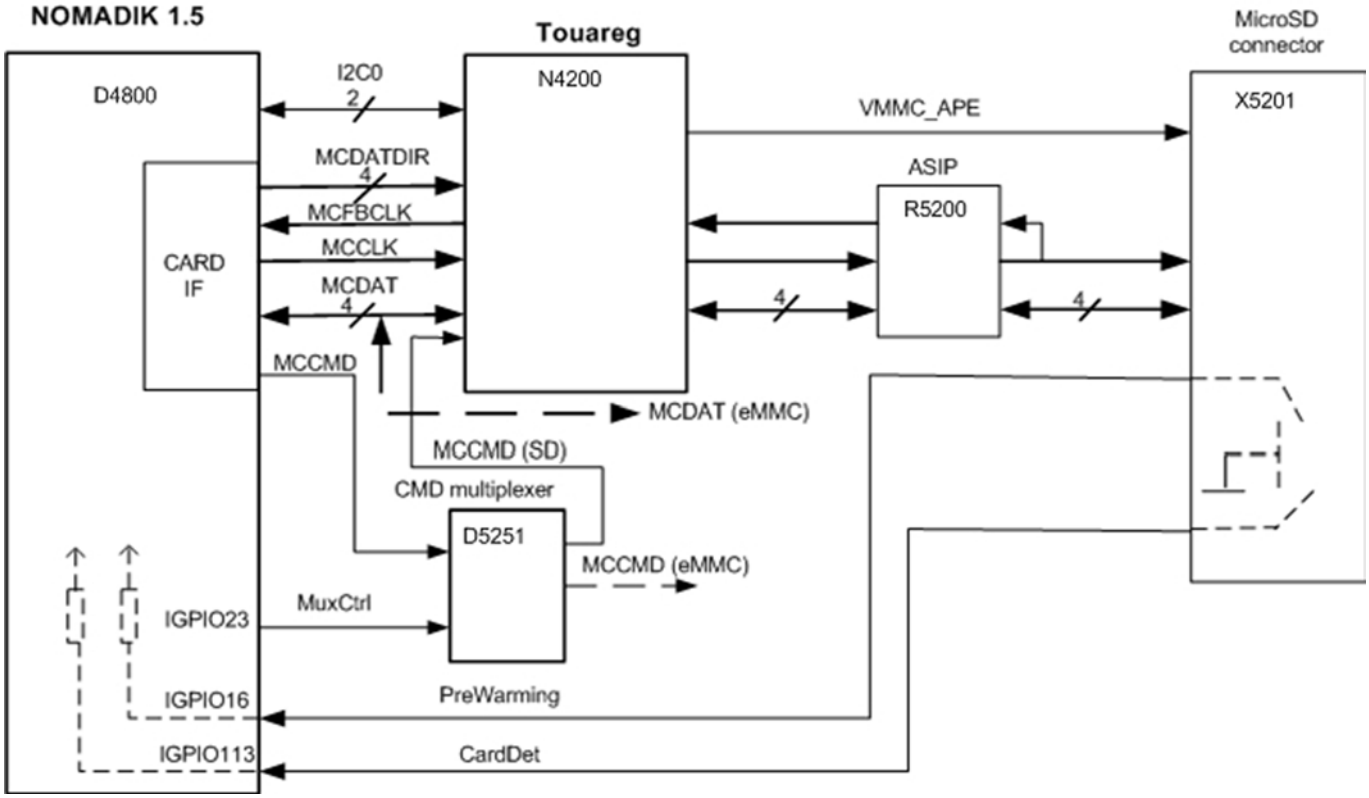


Figure 53 Pre-warning signal

TV-out interface

A TV-out connection is implemented using N4700 mobile video digital encoder, which converts digital video signals into high quality analog signal compliant with TV standards. Digital input video signal is CCIR656 interface from D4800 application IC. CCIR656 parallel interface uses 8 or 10 bits of multiplexed YCbCr data and a 27MHz clock (specified in ITU-R BT.656-4 recommendation). Supply voltages are VIO_APE, VCORE_APE and VAUX_APE from N4200 mixed-signal IC. For TV-out, the device supports composite (CVBS) video with different TV-standards: PAL-BDGHI, PAL-N, PAL-Nc, PAL-M, NTSC-J, NTSC-M and NTSC-4.34. CVBS is a single video signal containing all necessary information to reproduce a colour picture. The video signal is connected to an external AV-connector pin 3. Switch N2001 is used to connect AV-connector pin 3 into TV-out, the same pin is also used as a microphone line.

Copyright © 2008 Nokia. All rights reserved.

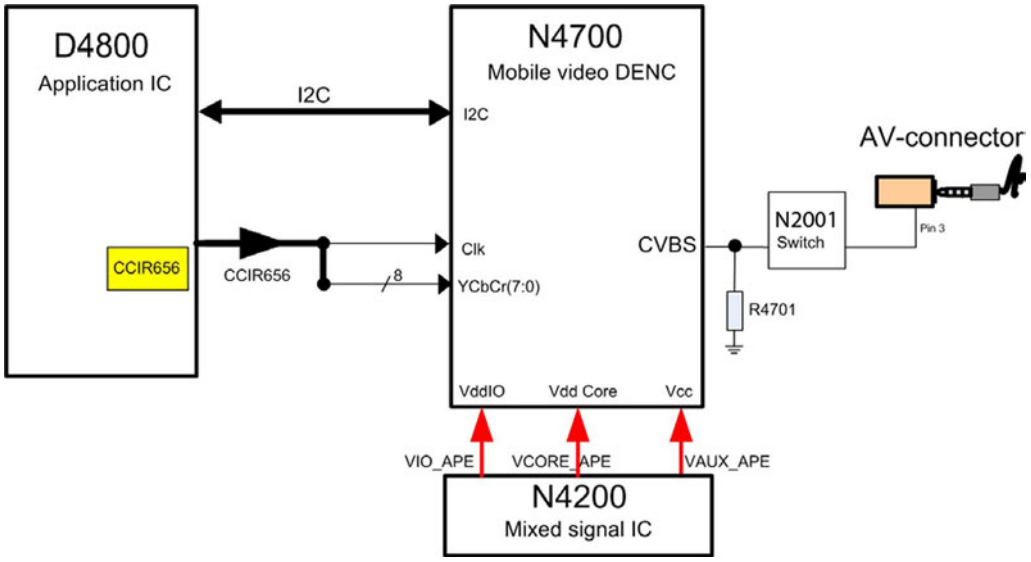


Figure 54 Block diagram of TV-out connection

DVB-H interface

The device has an integrated DVB-H receiver module. Module contains an integrated BB and RF chip, voltage regulator for the chip and filtering components. It is able to receive 6, 7 or 8MHz (channel width depending on used standard in different countries) DVB-H transmissions over 470-750MHz band.

The receiver decapsulates IP packets (e.g. audio and video data) from the stream and forwards them to the application processor.

The module contains all needed DVB-H receiver functions excluding antenna. Antenna is integrated to the C-cover and it also requires an external antenna tuning circuit which is controlled by the module itself.

Battery interface

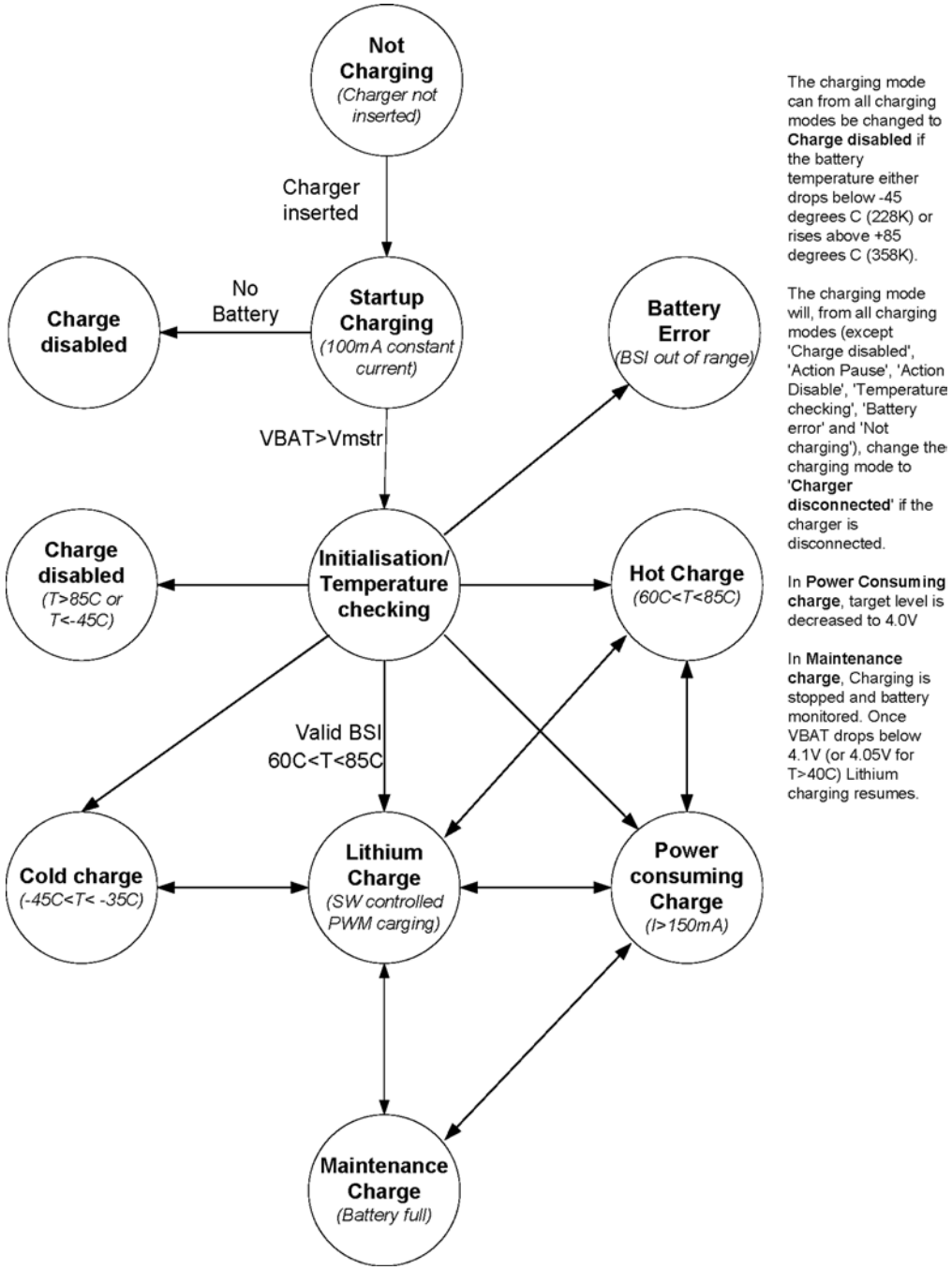
The device uses a 3-pole BL-5F battery. There are two manufacturers for BL-5F batteries and they have different discharge curves; SW recognizes battery manufacturer from BSI resistor value (27k or 82k).

Charging

Charging is controlled by different blocks depending on the situation: If the battery is totally empty, charging is controlled by CHACON block in N2300 and the battery is first charged with constant current until the voltage rises above a certain limit (VMSTR+). Then the digital part of N2300 takes care of the charging and PWM charging is done until PURX is released. After this, SW starts to control the charging.

The device has Li-Ion battery, which has a protection circuit that limits the lowest battery voltage to 2.8V, and constant current mode is practically never used.

Copyright © 2008 Nokia. All rights reserved.


Not Charging
(Charger not inserted)
Charger inserted
Charge disabled
No Battery
Startup Charging
(100mA constant current)
Battery Error
(BSI out of range)
VBAT>Vmstr
Charge disabled
(T>85C or T<-45C)
Initialisation/ Temperature checking
Hot Charge
(60C<T<85C)
Valid BSI
60C<T<85C
Cold charge
(-45C<T< -35C)
Lithium Charge
(SW controlled PWM carging)
Power consuming Charge
(I>150mA)
Maintenance Charge
(Battery full)
The charging mode can from all charging modes be changed to Charge disabled if the battery temperature either drops below -45 degrees C (228K) or rises above +85 degrees C (358K).
The charging mode will, from all charging modes (except 'Charge disabled', 'Action Pause', 'Action Disable', 'Temperature checking', 'Battery error' and 'Not charging'), change the charging mode to 'Charger disconnected' if the charger is disconnected.
In Power Consuming charge, target level is decreased to 4.0V
In Maintenance charge, Charging is stopped and battery monitored. Once VBAT drops below 4.1V (or 4.05V for T>40C) Lithium charging resumes.

Camera interfaces

Camera system

Camera sensors are connected directly to Nomadik 1.5, which has embedded image pre-processing block. Electrical interface consists of Nomadik 1.5 IPI2C for controlling camera module, a CCP2 interface for camera data (Main camera using CCP0. secondary camera CCP1), camera clock (ExtClk) and CAM0_SD / CAM1_SD data (Main camera / secondary camera) signal made by GPIO-pin for controlling camera shutdown. Camera is powered by Touareg1bis VIO SMPS (1.8V) and discrete linear regulator (2.8V). Main camera is 5MP Stingray; secondary camera is Acme lite (VGA). Camera system includes led flash with flash driver and indicator led. Flash driver and indicator led get control data through I2C from Nomadik. Two GPIO-pins are needed for enabling flash driver and flash timing strobe.

Copyright © 2008 Nokia. All rights reserved.

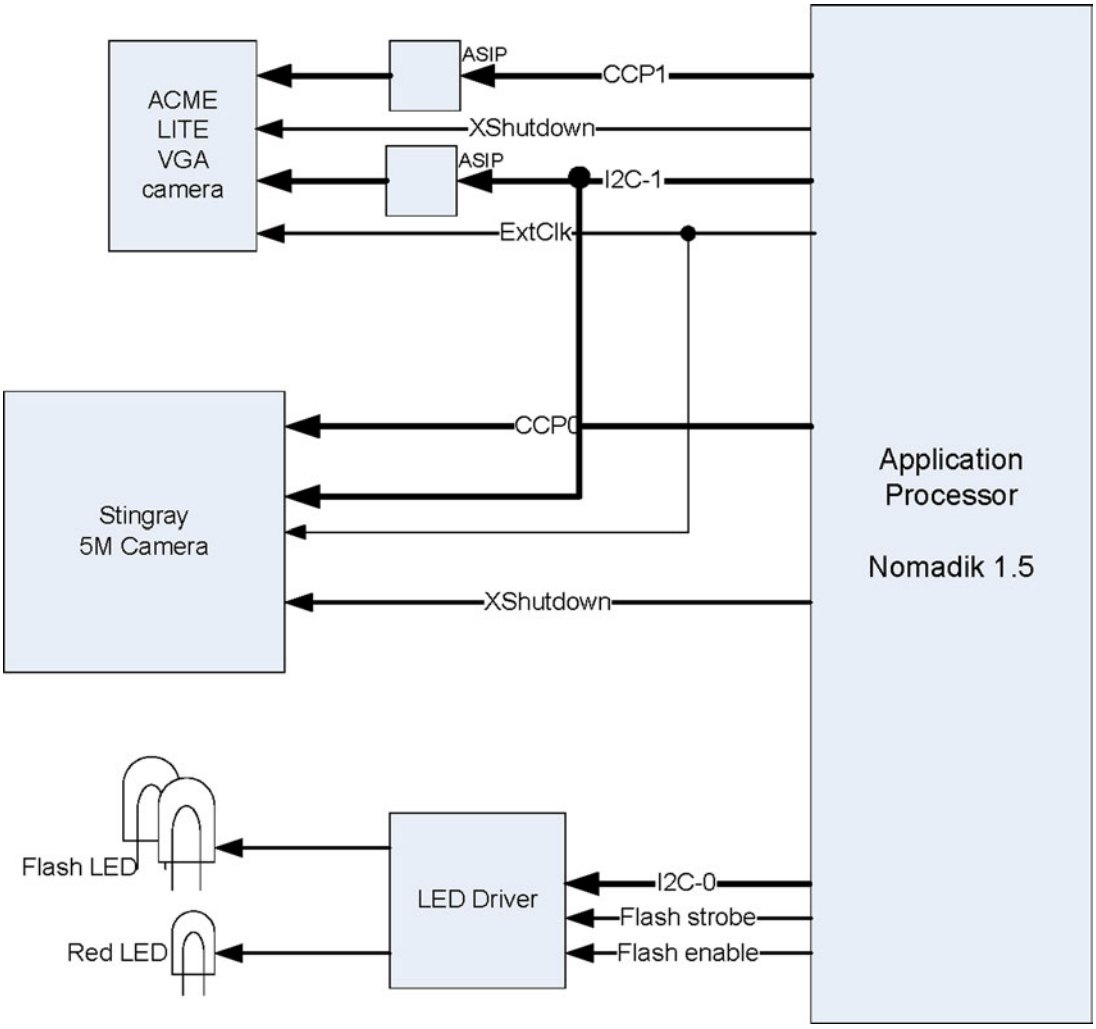


Figure 55 Camera system block diagram

Main camera characteristics

Sensor type	CMOS
Sensor photo detectors	5.0 million (2592 x 1968 pixels)
F number/Aperture	f/2.8
Focal length	5.2/31.8 mm (35 mm equal)
Focus range	10 cm to infinity
Still Image resolutions	up to 5 Megapixel: 2592x1944
Still images file format	EXIF (JPEG), *.jpg
Video resolutions	VGA 640 x 480 at 30 fps/15 fps 320 x 240 (QVGA) at 30/15 fps 176 x 144 at 15 fps (QCIF)

Copyright © 2008 Nokia. All rights reserved.

Video clip length	Maximal clip length is 60 mins (High or Normal quality) or limited to MMS size approx. 30 seconds (Sharing quality) **Note:** Clip length is dependable on available memory
Video file format	.mp4 (default) and .3gp (for MMS)
Auto exposure	Center weighted AE
White balance	Automatic, sunny, cloudy, incandescent, flurescent
Colour tones	Normal, sepia, vivid, black&white, negative
Capture Modes	Still capture mode, video mode and sequence mode
Selftimer	2, 10, or 20 secs
Flash settings	Auto, off, forced, anti red-eye
Automatic image rotation	On / Off

Camera flash

The device has also camera flash located directly beside the main camera, providing better image quality in darker environments. The flash has a built in red indicator that is used as a privacy indicator. The red led is lit during video recording and it is also used to indicate image capture with main camera. The camera flash is located on the flash PWB and the PWB is connected to the main PWB through connector.

The camera flash has two power white LEDs and one red LED inside the module. The flash PWB also includes a lens with its plastic housing to ensure a proper light pattern at the target.

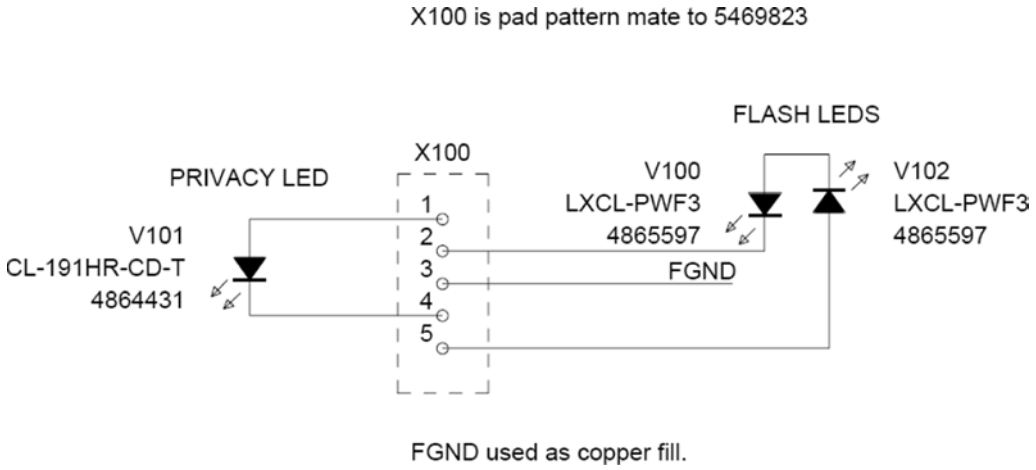


Figure 56 Camera flash circuit

Copyright © 2008 Nokia. All rights reserved.

Flash LED and privacy LED

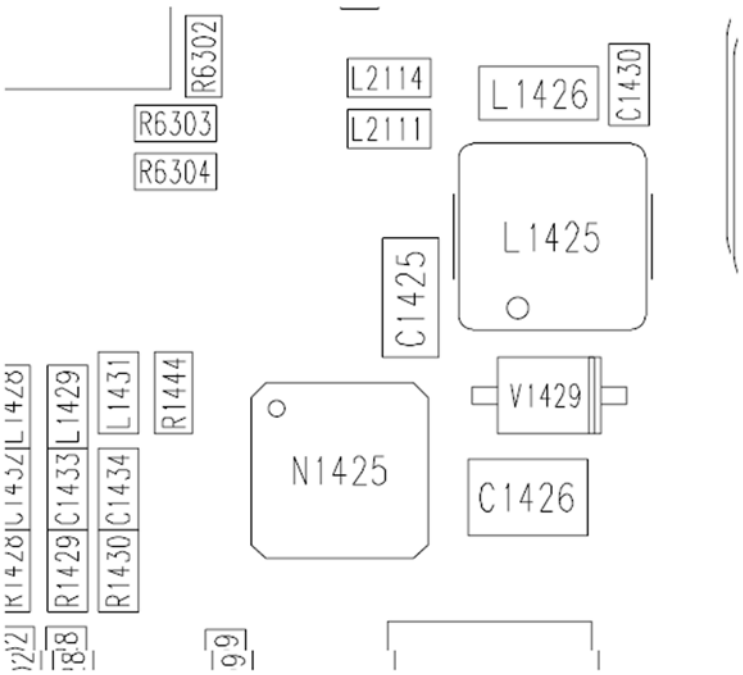


Figure 57 Driver IC on main PWB (top side) for Flash LEDs & privacy LED

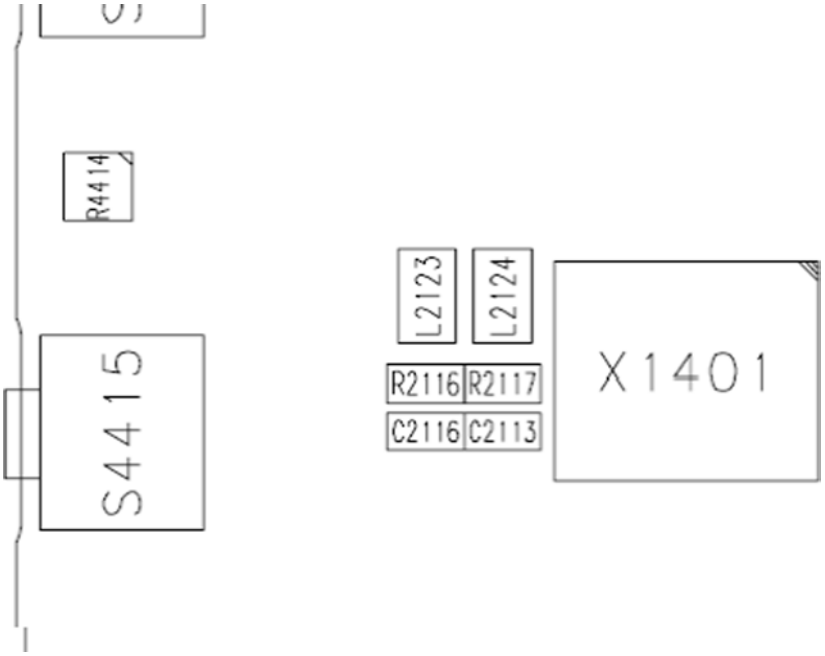


Figure 58 Spring connector (X1401) on main PWB (bottom side) for Flash LEDs & privacy LED

Copyright © 2008 Nokia. All rights reserved.

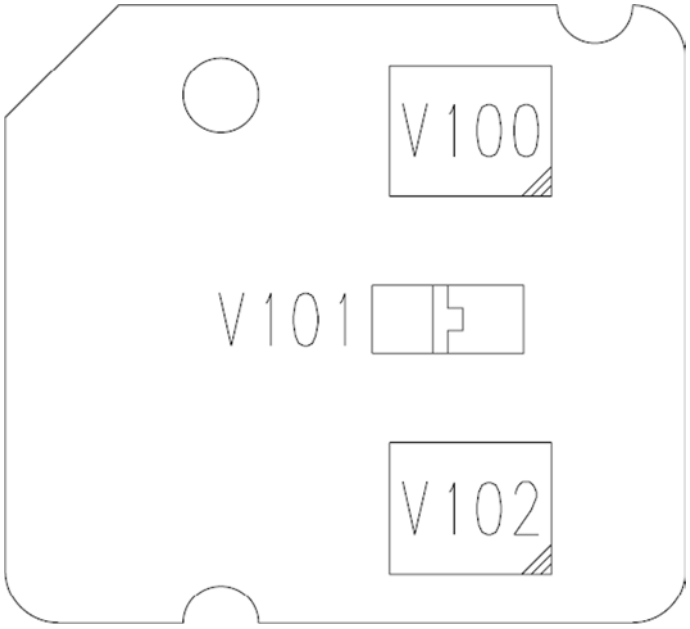


Figure 59 PWB of Flash LEDs & privacy LED, installed on the B-cover

Secondary camera characteristics

Sensor type	CMOS
Sensor Photo detectors	VGA
F number/Aperture	f/3.2
Focal length	1.1 mm
Focus range	20 cm to infinity
Still Image resolutions	VGA
Still images file format	JPEG/EXIF

Accelerometer

The device has an accelerometer, which is used in automatic image rotation. Accelerometer is connected to application processor through I^2C bus. Image rotation has build-in hysteresis.

Audio concept

Audio HW architecture

The functional core of the audio hardware is built around two ASIC's: Cellular Modem ASIC D2800 and the mixed signal EM ASIC N2200.

There are four audio transducers:

- Dynamic earpiece (part of UI/Slide module)
- 2 Dynamic speakers
- Electret microphone

In addition to the audio transducers, N2200 also provides an output for the dynamic Vibra component. All galvanic audio accessories are connected to the AV-connector. Bluetooth audio module, that is connected to Cellular Modem ASIC D2800 supports Bluetooth audio functionality. For some audio applications, part of the processing is done on application processor ASIC D4800, for example for Music Player.

Copyright © 2008 Nokia. All rights reserved.

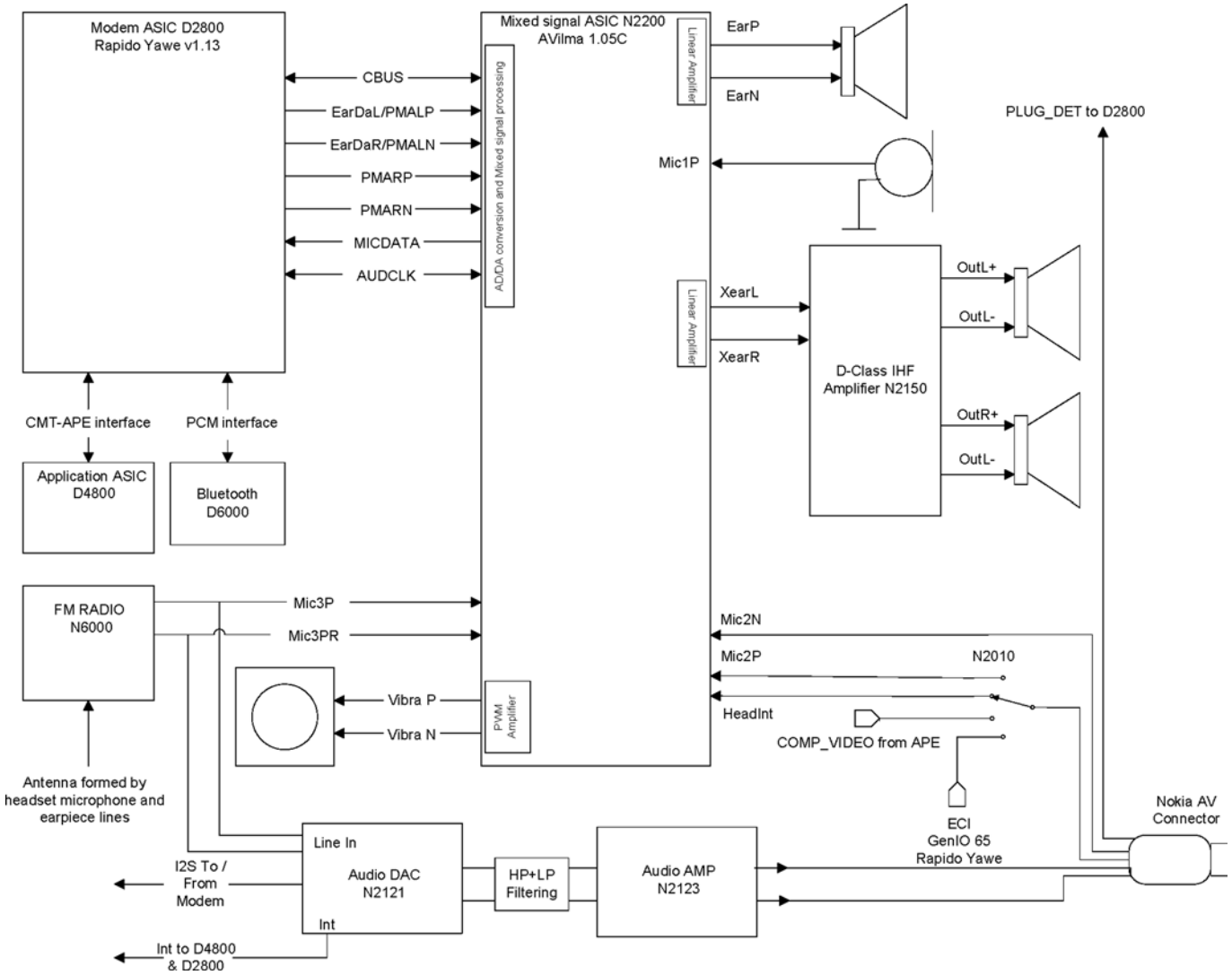


Figure 60 Audio block diagram

Internal microphone

The internal microphone is used for HandPortable (HP) and Internal HandsFree (IHF) call modes. Also if the accessory headset does not have microphone, the phone uses the internal microphone. An analogue electret microphone is connected to the EM ASIC N2200 Mic1P input via asymmetric electrical connection. The microphone is biased by the EM ASIC MicB1 bias voltage output.

Figure 61 Internal microphone

External microphone

Galvanic accessories are connected to the 3.5mm AV-connector. Accessory audio mode is automatically enabled/disabled during connection/disconnection of dedicated phone accessories. External microphone is connected to EM ASIC N2200 input Mic2P and Mic2N. Mic2P, Head_Det line of EM ASIC N2200 and Composite Video input from application ASIC are multiplexed to the same AV-connector line.

Copyright © 2008 Nokia. All rights reserved.

Internal earpiece

The internal earpiece is used in the HandPortable (HP) call mode. A dynamic 8 mm earpiece capsule is connected directly to the EM ASIC (N2200) differential outputs EarP and EarN through the flip flexi PWB and micro coaxial cable (X6 - X8900).

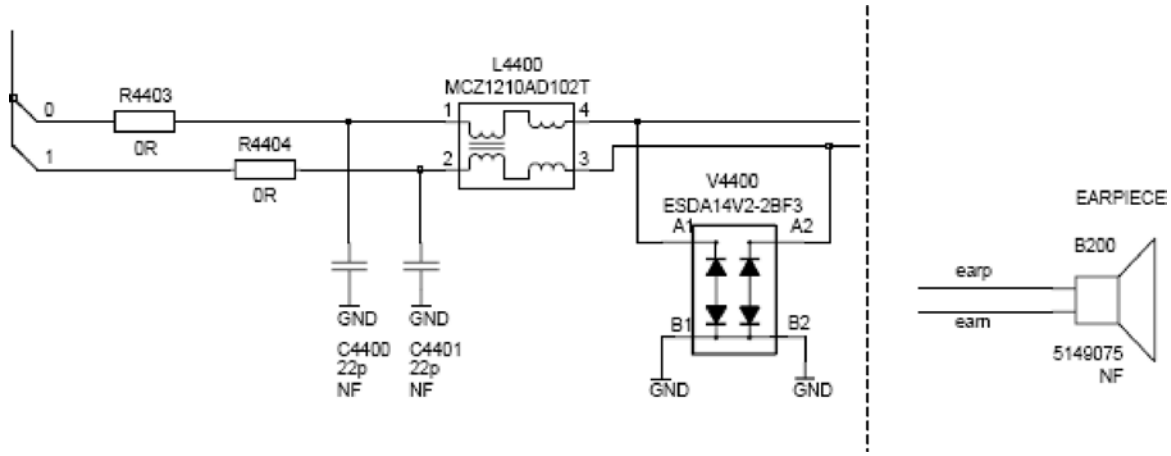


Figure 62 Internal earpiece schematics

Internal speaker

The internal speakers are used in Internal HandsFree (IHF) call mode and for ringing tones. They can also be used for example with GPS navigation instructions or with Music Player. Two dynamic speakers are connected to the N2120 stereo amplifier. Signal to the amplifier comes from N2200 outputs XearL and XearR.

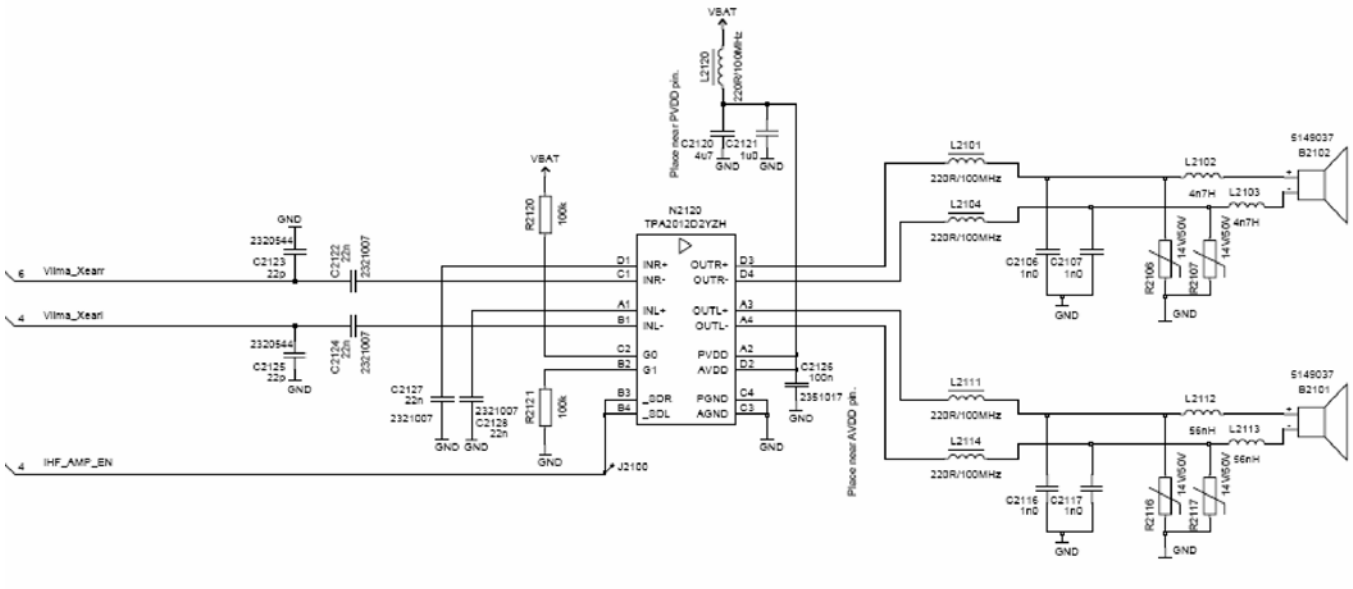


Figure 63 Stereo IHF connection

External earpiece

All galvanic accessories are connected to the AV-connector. Any accessory with 3.5mm plug can be used. Accessory detection mechanism is described in separate chapter. Stereo signal to external earpiece comes from N2200 outputs XearL and XearR. Attenuation is needed before headphone amplifier in the use case where ringing tone is played from IHF speakers and earpiece simultaneously.

Copyright © 2008 Nokia. All rights reserved.

AV connector

The device has a 3.5mm AV-connector. The user can use it to connect any audio accessory or e.g. TV-out cable to the phone. In-box headset (HS-43) is so-called Enhancement Control Interface (ECI) accessory. If the connected cable is not ECI accessory, cable recognizing is based on impedance on the microphone line. If the cable cannot be recognized, the user can select which accessory type is connected to the phone.

There are five Audio Control lines from Cellular Modem ASIC D2800 to control control audio and AV-connector related electronics. Those signals and default stages of the signals are described in the following table.

Table 17 AUDIOCTRL interface

Signal	Control	Default state / action
AUDIOCTRL(0), AVPaEn	Headphone amplifier	0 (shutdown)
AUDIOCTRL(1), AVPlugDet	Plug_det from AV-connector	1.8V (VIO), grounded when 3.5mm plug inserted
AUDIOCTRL(2), AVECICtrl	Mic2P / head_det switch N2001	Default 0 (microphone line connected to Mic2P). When 1, microphone line connected to head_det -> ECI-detection
AUDIOCTRL(3), AVVideoCtrl	Mic2P / Comp_Video switch N2001	Default 0, (microphone line connected to Mic2P). When 1, Composite Video from APE connected to microphone line.
AUDIOCTRL(4), IHF_AMP_EN	IHF amp N2120	Default 0, IHF amplifier and attenuation not used.

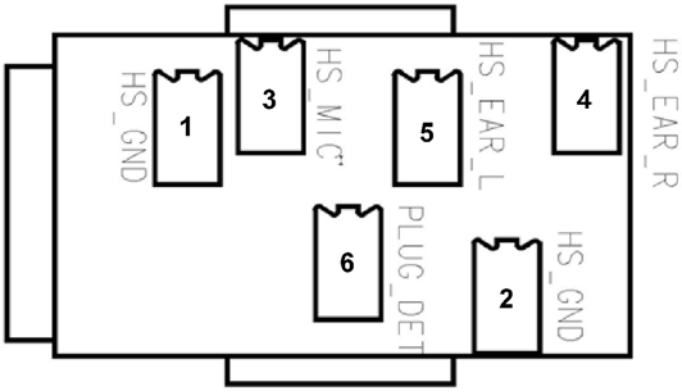


Figure 64 AV connector component layout and pads

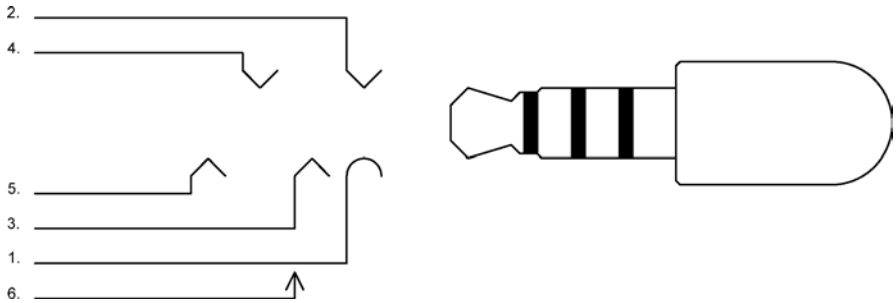


Figure 65 Connector pin layout (Plug conductors from left to right HS EAR L, HS EAR R, HS MIC/Cntrl. and HS GND)

Copyright © 2008 Nokia. All rights reserved.

Table 18 Pin configuration

3.5mm Pin #	Signal name	Direction	Description
6	PLUGDET	In	Terminal internal connection, plug detection
5	HS EAR L	In / Out	Audio output
4	HS EAR R	In / Out	Audio output,
3	HS MIC	In / Out	Multiplexed microphone audio and control data, C-video out
1, 2	HS GND	-	Ground contacts

There are three different use cases for AV connection. In all cases the PLUG_DET is used for detecting plug insertion and removal. EAR lines are used for FM antenna reception.

- **Headset or similar with ECI or without ECI.**

  When a headset is detected the terminal will check if there is ECI circuit in the accessory. If the ECI chip is present, tuning values for that is taken into use otherwise basic audio tuning parameters are used.
- **Headphones**

  For the headphones and any 3-pole connector devices, the headphones option is used.

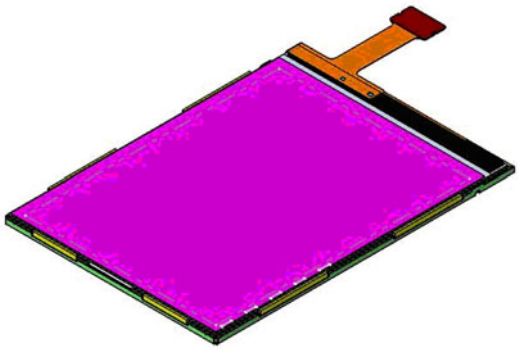
  Note: The mic line and the ground line are connected together.
- **Video out**

  For example, when connecting terminal to television all pins are used.

  Note: The microphone is multiplexed to C-video. The cable has to be inserted first to television set and then to the terminal, otherwise the automatic detection does not work according to the specification.

User interface

Display



Display features

- Module size (width x height x thickness) 47.48 mm X 67.14 mm X 2.041 mm
- Resolution QVGA (240*320)
- Numbers of colours up to 16.7M
- Partial display function; power saving by pausing display process on part of the screen

Copyright © 2008 Nokia. All rights reserved.

- Built-in RAM capacity 240 columns x 320 rows x 24 bits RAM
- Transflective optics

The display has two different operating modes:

- Normal mode, Full screen, 16.7 million colors
- Partial idle mode, 8 colors but only part of the display is active

Display is located in the UI/Slide module. The interconnection between the LCD module and the UI-FPC implemented with a 24-pin board-to-board-connector.

The display is controlled via MeSSi-8 interface with an 8-bit bus by the application processor. All MeSSi signals go through the EMC filtering ASIPs (Z5402 and Z5403). The display module does not require any tunings in service.

Display and keyboard backlight

Display backlight LEDs are connected in parallel in display module. Also the driver for display backlight LEDs is integrated to the module itself. Display LED's brightness is controlled by application processor (D4800) via Messi interface. Automatic dimming functionality is integrated into display module itself.

The device uses two 'current pump' type LED drivers (N4400 and N4401) to drive S60 keyboard LEDs, ITU keyboard LEDs, multimedia keyboard and gaming key LEDs. All the backlight groups can be turned ON/OFF separately.

Copyright © 2008 Nokia. All rights reserved.

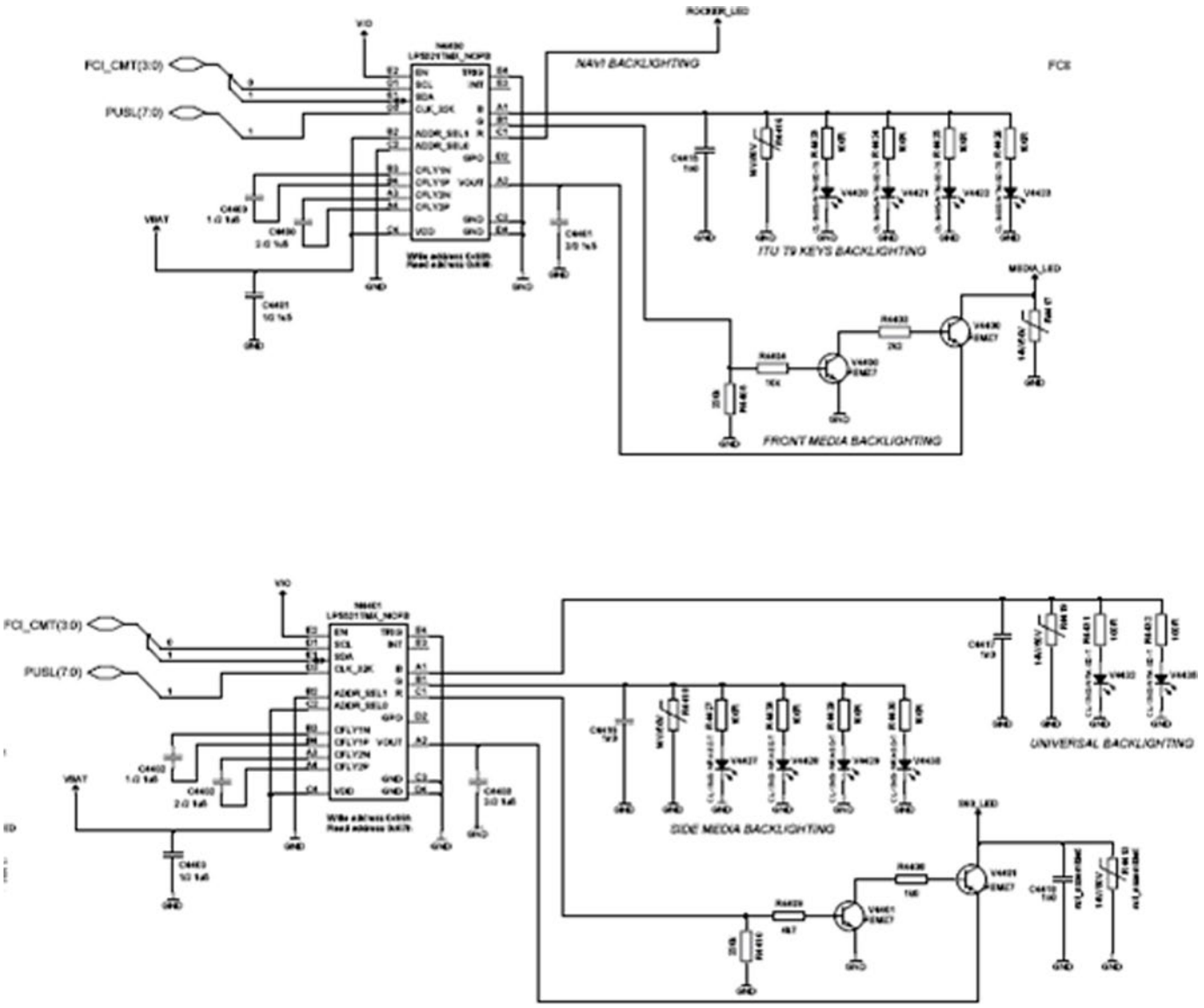


Figure 66 Backlight circuitry

Keyboard

The device has three separate keyboards:

- S60 keyboard
- ITU keyboard
- Multimedia keyboard

The S60 keyboard and multimedia keyboard are assembled on the UI/slide module. If there's failure on these parts, whole module has to be replaced. ITU keyboard pads are placed directly on the system/RF module.

ITU keyboard is visible, when display is moved upwards. Keypads are on the system/RF module. System/RF module includes also side keys (volume keys and 2-position camera key).

	COL0: GPIO106	COL1: GPIO107	COL2: GPIO109	COL3: GPIO116	COL4: GPIO108	COL5: GPIO114
ROW0: GPIO40	Up	Left	Vol. U.	Vol. D.	Appl	Send

Copyright © 2008 Nokia. All rights reserved.

ROW1: GPIO41	Down	Right	>> (2)	<< (2)	Clear	Select
ROW2: GPIO42			1	6	8	
ROW3: GPIO43			5	7	#	Stop (1)
ROW4: GPIO44	End	<< (1)	9	0	3	Play (1)
ROW5: GPIO45	Shutter (H)	Shutter (F)	*	2	4	
ROW6: GPIO46	L-Soft	R-Soft	Stop (2)/ Gaming	Play (2)/ Gaming	Access	>> (1)

Row lines are filtered with Z4401 and column lines are filtered with Z4400. Power key is also placed on the system/RF module. It is connected directly to EM ASIC N2200 PWRONX PIN.

Slide position sensors

Two Hall sensors are used to detect slide movement upwards or downwards. One magnet triggers both sensors. The magnet is placed in the UI/slide module, under the display. The hall sensor, that detects opening of the ITU keyboard, is on the bottom side of the PWB. Opening the multimedia keyboard is detected with the hall sensor that is on the top of the PWB. Hall sensors are connected to the application ASIC (D4800) GPIO's.

Copyright © 2008 Nokia. All rights reserved.

RF description

Block diagram

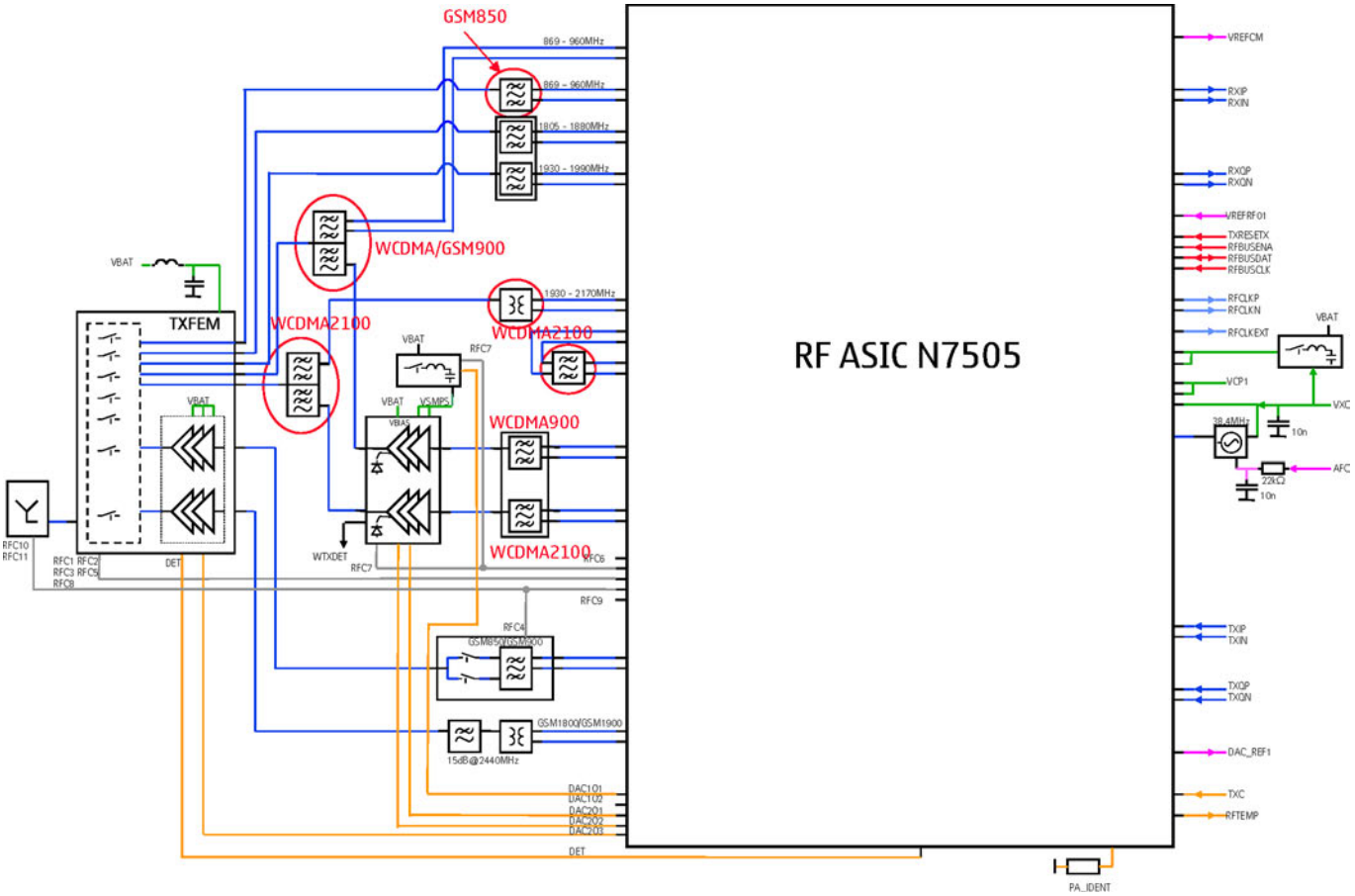


Figure 67 RF block diagram

The RF block diagram for RM-247 uses RF ASIC N7505 that performs the RF back-end functions of receive and transmit function of the cellular transceiver.

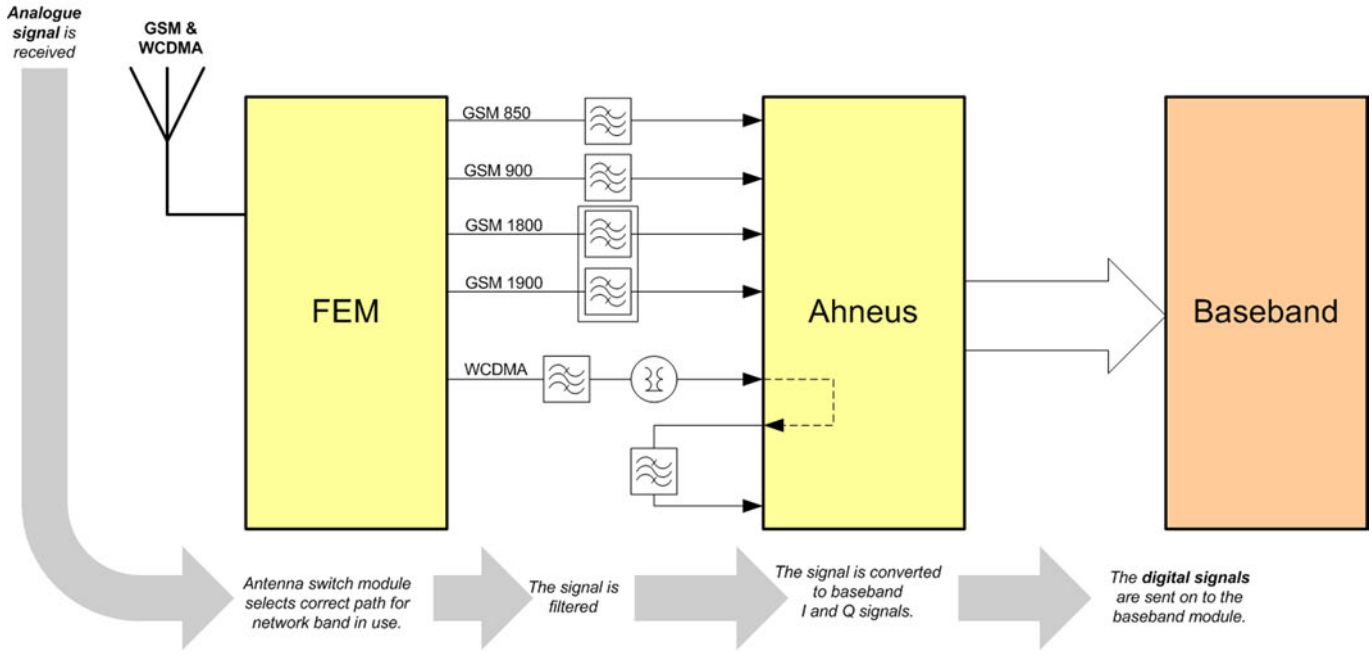
Receiver (RX)

An analogue signal is received by the phone's antenna. The signal is converted to a digital signal and is then transferred further to the baseband (eg. to the earpiece).

The receiver functions are implemented in the RF ASIC.

Signals with different frequencies take different paths, therefore being handled by different components. The principle of GSM and WCDMA is the same.

Copyright © 2008 Nokia. All rights reserved.

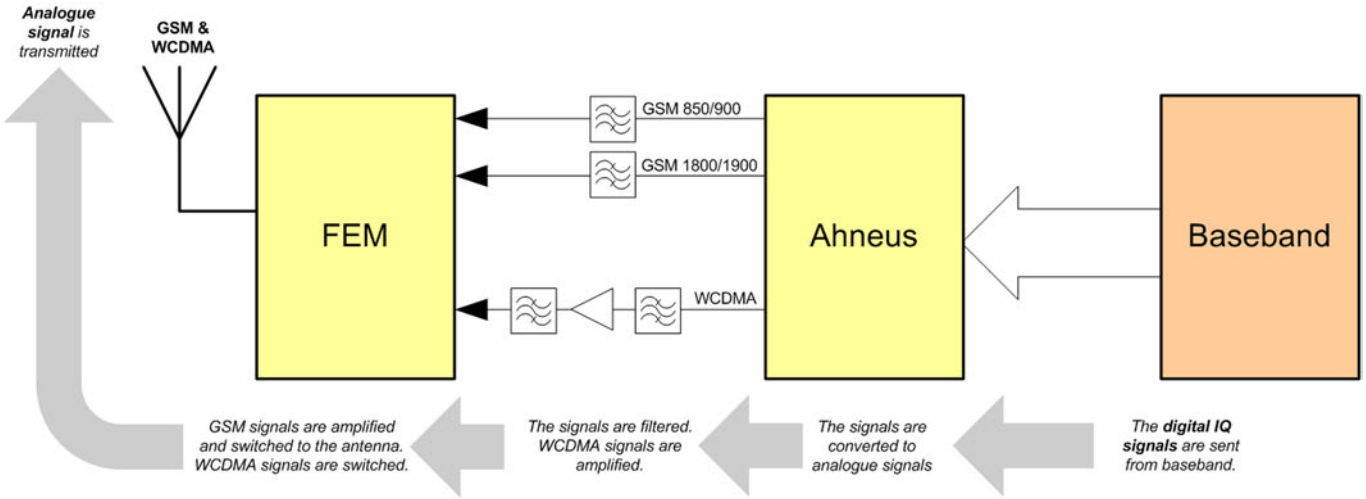


Transmitter (TX)

The digital baseband signal (eg. from the microphone) is converted to an analogue signal, which is then amplified and transmitted from the antenna. The frequency of this signal can be tuned to match the bandwith of the system in use (eg. GSM900).

The transmitter functions are implemented in the RF ASIC.

Even though the GSM and WCDMA signals are sent via different components, the principles of the transmission is the same.


Analogue signal is transmitted
GSM & WCDMA
FEM
GSM 850/900
GSM 1800/1900
WCDMA
Ahneus
Baseband
GSM signals are amplified and switched to the antenna. WCDMA signals are switched.
The signals are filtered. WCDMA signals are amplified.
The signals are converted to analogue signals
The digital IQ signals are sent from baseband.

Copyright © 2008 Nokia. All rights reserved.

Frequency mappings

GSM850 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
128	824.2	869.2	3296.8	3476.8	170	832.6	877.6	3330.4	3510.4	212	841.0	886.0	3364.0	3544.0
129	824.4	869.4	3297.6	3477.6	171	832.8	877.8	3331.2	3511.2	213	841.2	886.2	3364.8	3544.8
130	824.6	869.6	3298.4	3478.4	172	833.0	878.0	3332.0	3512.0	214	841.4	886.4	3365.6	3545.6
131	824.8	869.8	3299.2	3479.2	173	833.2	878.2	3332.8	3512.8	215	841.6	886.6	3366.4	3546.4
132	825.0	870.0	3300.0	3480.0	174	833.4	878.4	3333.6	3513.6	216	841.8	886.8	3367.2	3547.2
133	825.2	870.2	3300.8	3480.8	175	833.6	878.6	3334.4	3514.4	217	842.0	887.0	3368.0	3548.0
134	825.4	870.4	3301.6	3481.6	176	833.8	878.8	3335.2	3515.2	218	842.2	887.2	3368.8	3548.8
135	825.6	870.6	3302.4	3482.4	177	834.0	879.0	3336.0	3516.0	219	842.4	887.4	3369.6	3549.6
136	825.8	870.8	3303.2	3483.2	178	834.2	879.2	3336.8	3516.8	220	842.6	887.6	3370.4	3550.4
137	826.0	871.0	3304.0	3484.0	179	834.4	879.4	3337.6	3517.6	221	842.8	887.8	3371.2	3551.2
138	826.2	871.2	3304.8	3484.8	180	834.6	879.6	3338.4	3518.4	222	843.0	888.0	3372.0	3552.0
139	826.4	871.4	3305.6	3485.6	181	834.8	879.8	3339.2	3519.2	223	843.2	888.2	3372.8	3552.8
140	826.6	871.6	3306.4	3486.4	182	835.0	880.0	3340.0	3520.0	224	843.4	888.4	3373.6	3553.6
141	826.8	871.8	3307.2	3487.2	183	835.2	880.2	3340.8	3520.8	225	843.6	888.6	3374.4	3554.4
142	827.0	872.0	3308.0	3488.0	184	835.4	880.4	3341.6	3521.6	226	843.8	888.8	3375.2	3555.2
143	827.2	872.2	3308.8	3488.8	185	835.6	880.6	3342.4	3522.4	227	844.0	889.0	3376.0	3556.0
144	827.4	872.4	3309.6	3489.6	186	835.8	880.8	3343.2	3523.2	228	844.2	889.2	3376.8	3556.8
145	827.6	872.6	3310.4	3490.4	187	836.0	881.0	3344.0	3524.0	229	844.4	889.4	3377.6	3557.6
146	827.8	872.8	3311.2	3491.2	188	836.2	881.2	3344.8	3524.8	230	844.6	889.6	3378.4	3558.4
147	828.0	873.0	3312.0	3492.0	189	836.4	881.4	3345.6	3525.6	231	844.8	889.8	3379.2	3559.2
148	828.2	873.2	3312.8	3492.8	190	836.6	881.6	3346.4	3526.4	232	845.0	890.0	3380.0	3560.0
149	828.4	873.4	3313.6	3493.6	191	836.8	881.8	3347.2	3527.2	233	845.2	890.2	3380.8	3560.8
150	828.6	873.6	3314.4	3494.4	192	837.0	882.0	3348.0	3528.0	234	845.4	890.4	3381.6	3561.6
151	828.8	873.8	3315.2	3495.2	193	837.2	882.2	3348.8	3528.8	235	845.6	890.6	3382.4	3562.4
152	829.0	874.0	3316.0	3496.0	194	837.4	882.4	3349.6	3529.6	236	845.8	890.8	3383.2	3563.2
153	829.2	874.2	3316.8	3496.8	195	837.6	882.6	3350.4	3530.4	237	846.0	891.0	3384.0	3564.0
154	829.4	874.4	3317.6	3497.6	196	837.8	882.8	3351.2	3531.2	238	846.2	891.2	3384.8	3564.8
155	829.6	874.6	3318.4	3498.4	197	838.0	883.0	3352.0	3532.0	239	846.4	891.4	3385.6	3565.6
156	829.8	874.8	3319.2	3499.2	198	838.2	883.2	3352.8	3532.8	240	846.6	891.6	3386.4	3566.4
157	830.0	875.0	3320.0	3500.0	199	838.4	883.4	3353.6	3533.6	241	846.8	891.8	3387.2	3567.2
158	830.2	875.2	3320.8	3500.8	200	838.6	883.6	3354.4	3534.4	242	847.0	892.0	3388.0	3568.0
159	830.4	875.4	3321.6	3501.6	201	838.8	883.8	3355.2	3535.2	243	847.2	892.2	3388.8	3568.8
160	830.6	875.6	3322.4	3502.4	202	839.0	884.0	3356.0	3536.0	244	847.4	892.4	3389.6	3569.6
161	830.8	875.8	3323.2	3503.2	203	839.2	884.2	3356.8	3536.8	245	847.6	892.6	3390.4	3570.4
162	831.0	876.0	3324.0	3504.0	204	839.4	884.4	3357.6	3537.6	246	847.8	892.8	3391.2	3571.2
163	831.2	876.2	3324.8	3504.8	205	839.6	884.6	3358.4	3538.4	247	848.0	893.0	3392.0	3572.0
164	831.4	876.4	3325.6	3505.6	206	839.8	884.8	3359.2	3539.2	248	848.2	893.2	3392.8	3572.8
165	831.6	876.6	3326.4	3506.4	207	840.0	885.0	3360.0	3540.0	249	848.4	893.4	3393.6	3573.6
166	831.8	876.8	3327.2	3507.2	208	840.2	885.2	3360.8	3540.8	250	848.6	893.6	3394.4	3574.4
167	832.0	877.0	3328.0	3508.0	209	840.4	885.4	3361.6	3541.6	251	848.8	893.8	3395.2	3575.2

Copyright © 2008 Nokia. All rights reserved.

EGSM900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
975	880,2	925,2	3520,8	3700,8	1	890,2	935,2	3560,8	3740,8	63	902,6	947,6	3610,4	3790,4
976	880,4	925,4	3521,6	3701,6	2	890,4	935,4	3561,6	3741,6	64	902,8	947,8	3611,2	3791,2
977	880,6	925,6	3522,4	3702,4	3	890,6	935,6	3562,4	3742,4	65	903,0	948,0	3612,0	3792,0
978	880,8	925,8	3523,2	3703,2	4	890,8	935,8	3563,2	3743,2	66	903,2	948,2	3612,8	3792,8
979	881,0	926,0	3524,0	3704,0	5	891,0	936,0	3564,0	3744,0	67	903,4	948,4	3613,6	3793,6
980	881,2	926,2	3524,8	3704,8	6	891,2	936,2	3564,8	3744,8	68	903,6	948,6	3614,4	3794,4
981	881,4	926,4	3525,6	3705,6	7	891,4	936,4	3565,6	3745,6	69	903,8	948,8	3615,2	3795,2
982	881,6	926,6	3526,4	3706,4	8	891,6	936,6	3566,4	3746,4	70	904,0	949,0	3616,0	3796,0
983	881,8	926,8	3527,2	3707,2	9	891,8	936,8	3567,2	3747,2	71	904,2	949,2	3616,8	3796,8
984	882,0	927,0	3528,0	3708,0	10	892,0	937,0	3568,0	3748,0	72	904,4	949,4	3617,6	3797,6
985	882,2	927,2	3528,8	3708,8	11	892,2	937,2	3568,8	3748,8	73	904,6	949,6	3618,4	3798,4
986	882,4	927,4	3529,6	3709,6	12	892,4	937,4	3569,6	3749,6	74	904,8	949,8	3619,2	3799,2
987	882,6	927,6	3530,4	3710,4	13	892,6	937,6	3570,4	3750,4	75	905,0	950,0	3620,0	3800,0
988	882,8	927,8	3531,2	3711,2	14	892,8	937,8	3571,2	3751,2	76	905,2	950,2	3620,8	3800,8
989	883,0	928,0	3532,0	3712,0	15	893,0	938,0	3572,0	3752,0	77	905,4	950,4	3621,6	3801,6
990	883,2	928,2	3532,8	3712,8	16	893,2	938,2	3572,8	3752,8	78	905,6	950,6	3622,4	3802,4
991	883,4	928,4	3533,6	3713,6	17	893,4	938,4	3573,6	3753,6	79	905,8	950,8	3623,2	3803,2
992	883,6	928,6	3534,4	3714,4	18	893,6	938,6	3574,4	3754,4	80	906,0	951,0	3624,0	3804,0
993	883,8	928,8	3535,2	3715,2	19	893,8	938,8	3575,2	3755,2	81	906,2	951,2	3624,8	3804,8
994	884,0	929,0	3536,0	3716,0	20	894,0	939,0	3576,0	3756,0	82	906,4	951,4	3625,6	3805,6
995	884,2	929,2	3536,8	3716,8	21	894,2	939,2	3576,8	3756,8	83	906,6	951,6	3626,4	3806,4
996	884,4	929,4	3537,6	3717,6	22	894,4	939,4	3577,6	3757,6	84	906,8	951,8	3627,2	3807,2
997	884,6	929,6	3538,4	3718,4	23	894,6	939,6	3578,4	3758,4	85	907,0	952,0	3628,0	3808,0
998	884,8	929,8	3539,2	3719,2	24	894,8	939,8	3579,2	3759,2	86	907,2	952,2	3628,8	3808,8
999	885,0	930,0	3540,0	3720,0	25	895,0	940,0	3580,0	3760,0	87	907,4	952,4	3629,6	3809,6
1000	885,2	930,2	3540,8	3720,8	26	895,2	940,2	3580,8	3760,8	88	907,6	952,6	3630,4	3810,4
1001	885,4	930,4	3541,6	3721,6	27	895,4	940,4	3581,6	3761,6	89	907,8	952,8	3631,2	3811,2
1002	885,6	930,6	3542,4	3722,4	28	895,6	940,6	3582,4	3762,4	90	908,0	953,0	3632,0	3812,0
1003	885,8	930,8	3543,2	3723,2	29	895,8	940,8	3583,2	3763,2	91	908,2	953,2	3632,8	3812,8
1004	886,0	931,0	3544,0	3724,0	30	896,0	941,0	3584,0	3764,0	92	908,4	953,4	3633,6	3813,6
1005	886,2	931,2	3544,8	3724,8	31	896,2	941,2	3584,8	3764,8	93	908,6	953,6	3634,4	3814,4
1006	886,4	931,4	3545,6	3725,6	32	896,4	941,4	3585,6	3765,6	94	908,8	953,8	3635,2	3815,2
1007	886,6	931,6	3546,4	3726,4	33	896,6	941,6	3586,4	3766,4	95	909,0	954,0	3636,0	3816,0
1008	886,8	931,8	3547,2	3727,2	34	896,8	941,8	3587,2	3767,2	96	909,2	954,2	3636,8	3816,8
1009	887,0	932,0	3548,0	3728,0	35	897,0	942,0	3588,0	3768,0	97	909,4	954,4	3637,6	3817,6
1010	887,2	932,2	3548,8	3728,8	36	897,2	942,2	3588,8	3768,8	98	909,6	954,6	3638,4	3818,4
1011	887,4	932,4	3549,6	3729,6	37	897,4	942,4	3589,6	3769,6	99	909,8	954,8	3639,2	3819,2
1012	887,6	932,6	3550,4	3730,4	38	897,6	942,6	3590,4	3770,4	100	910,0	955,0	3640,0	3820,0
1013	887,8	932,8	3551,2	3731,2	39	897,8	942,8	3591,2	3771,2	101	910,2	955,2	3640,8	3820,8
1014	888,0	933,0	3552,0	3732,0	40	898,0	943,0	3592,0	3772,0	102	910,4	955,4	3641,6	3821,6
1015	888,2	933,2	3552,8	3732,8	41	898,2	943,2	3592,8	3772,8	103	910,6	955,6	3642,4	3822,4
1016	888,4	933,4	3553,6	3733,6	42	898,4	943,4	3593,6	3773,6	104	910,8	955,8	3643,2	3823,2
1017	888,6	933,6	3554,4	3734,4	43	898,6	943,6	3594,4	3774,4	105	911,0	956,0	3644,0	3824,0
1018	888,8	933,8	3555,2	3735,2	44	898,8	943,8	3595,2	3775,2	106	911,2	956,2	3644,8	3824,8
1019	889,0	934,0	3556,0	3736,0	45	899,0	944,0	3596,0	3776,0	107	911,4	956,4	3645,6	3825,6
1020	889,2	934,2	3556,8	3736,8	46	899,2	944,2	3596,8	3776,8	108	911,6	956,6	3646,4	3826,4
1021	889,4	934,4	3557,6	3737,6	47	899,4	944,4	3597,6	3777,6	109	911,8	956,8	3647,2	3827,2
1022	889,6	934,6	3558,4	3738,4	48	899,6	944,6	3598,4	3778,4	110	912,0	957,0	3648,0	3828,0
1023	889,8	934,8	3559,2	3739,2	49	899,8	944,8	3599,2	3779,2	111	912,2	957,2	3648,8	3828,8
0	890,0	935,0	3560,0	3740,0	50	900,0	945,0	3600,0	3780,0	112	912,4	957,4	3649,6	3829,6
					51	900,2	945,2	3600,8	3780,8	113	912,6	957,6	3650,4	3830,4
					52	900,4	945,4	3601,6	3781,6	114	912,8	957,8	3651,2	3831,2
					53	900,6	945,6	3602,4	3782,4	115	913,0	958,0	3652,0	3832,0
					54	900,8	945,8	3603,2	3783,2	116	913,2	958,2	3652,8	3832,8
					55	901,0	946,0	3604,0	3784,0	117	913,4	958,4	3653,6	3833,6
					56	901,2	946,2	3604,8	3784,8	118	913,6	958,6	3654,4	3834,4
					57	901,4	946,4	3605,6	3785,6	119	913,8	958,8	3655,2	3835,2
					58	901,6	946,6	3606,4	3786,4	120	914,0	959,0	3656,0	3836,0
					59	901,8	946,8	3607,2	3787,2	121	914,2	959,2	3656,8	3836,8
					60	902,0	947,0	3608,0	3788,0	122	914,4	959,4	3657,6	3837,6
					61	902,2	947,2	3608,8	3788,8	123	914,6	959,6	3658,4	3838,4
					62	902,4	947,4	3609,6	3789,6	124	914,8	959,8	3659,2	3839,2

Copyright © 2008 Nokia. All rights reserved.

GSM1800 frequencies

Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx	Ch	Tx	Rx	VCO Tx	VCO Rx
512	1710.2	1805.2	3420.4	3610.4	606	1729.0	1824.0	3458.0	3648.0	700	1747.8	1842.8	3495.6	3685.6	793	1766.4	1861.4	3532.8	3722.8
513	1710.4	1805.4	3420.8	3610.8	607	1729.2	1824.2	3458.4	3648.4	701	1748.0	1843.0	3496.0	3686.0	794	1766.6	1861.6	3533.2	3723.2
514	1710.6	1805.6	3421.2	3611.2	608	1729.4	1824.4	3458.8	3648.8	702	1748.2	1843.2	3496.4	3686.4	795	1766.8	1861.8	3533.6	3723.6
515	1710.8	1805.8	3421.6	3611.6	609	1729.6	1824.6	3459.2	3649.2	703	1748.4	1843.4	3496.8	3686.8	796	1767.0	1862.0	3534.0	3724.0
516	1711.0	1806.0	3422.0	3612.0	610	1729.8	1824.8	3459.6	3649.6	704	1748.6	1843.6	3497.2	3687.2	797	1767.2	1862.2	3534.4	3724.4
517	1711.2	1806.2	3422.4	3612.4	611	1730.0	1825.0	3460.0	3650.0	705	1748.8	1843.8	3497.6	3687.6	798	1767.4	1862.4	3534.8	3724.8
518	1711.4	1806.4	3422.8	3612.8	612	1730.2	1825.2	3460.4	3650.4	706	1749.0	1844.0	3498.0	3688.0	799	1767.6	1862.6	3535.2	3725.2
519	1711.6	1806.6	3423.2	3613.2	613	1730.4	1825.4	3460.8	3650.8	707	1749.2	1844.2	3498.4	3688.4	800	1767.8	1862.8	3535.6	3725.6
520	1711.8	1806.8	3423.6	3613.6	614	1730.6	1825.6	3461.2	3651.2	708	1749.4	1844.4	3498.8	3688.8	801	1768.0	1863.0	3536.0	3726.0
521	1712.0	1807.0	3424.0	3614.0	615	1730.8	1825.8	3461.6	3651.6	709	1749.6	1844.6	3499.2	3689.2	802	1768.2	1863.2	3536.4	3726.4
522	1712.2	1807.2	3424.4	3614.4	616	1731.0	1826.0	3462.0	3652.0	710	1749.8	1844.8	3499.6	3689.6	803	1768.4	1863.4	3536.8	3726.8
523	1712.4	1807.4	3424.8	3614.8	617	1731.2	1826.2	3462.4	3652.4	711	1750.0	1845.0	3500.0	3690.0	804	1768.6	1863.6	3537.2	3727.2
524	1712.6	1807.6	3425.2	3615.2	618	1731.4	1826.4	3462.8	3652.8	712	1750.2	1845.2	3500.4	3690.4	805	1768.8	1863.8	3537.6	3727.6
525	1712.8	1807.8	3425.6	3615.6	619	1731.6	1826.6	3463.2	3653.2	713	1750.4	1845.4	3500.8	3690.8	806	1769.0	1864.0	3538.0	3728.0
526	1713.0	1808.0	3426.0	3616.0	620	1731.8	1826.8	3463.6	3653.6	714	1750.6	1845.6	3501.2	3691.2	807	1769.2	1864.2	3538.4	3728.4
527	1713.2	1808.2	3426.4	3616.4	621	1732.0	1827.0	3464.0	3654.0	715	1750.8	1845.8	3501.6	3691.6	808	1769.4	1864.4	3538.8	3728.8
528	1713.4	1808.4	3426.8	3616.8	622	1732.2	1827.2	3464.4	3654.4	716	1751.0	1846.0	3502.0	3692.0	809	1769.6	1864.6	3539.2	3729.2
529	1713.6	1808.6	3427.2	3617.2	623	1732.4	1827.4	3464.8	3654.8	717	1751.2	1846.2	3502.4	3692.4	810	1769.8	1864.8	3539.6	3729.6
530	1713.8	1808.8	3427.6	3617.6	624	1732.6	1827.6	3465.2	3655.2	718	1751.4	1846.4	3502.8	3692.8	811	1770.0	1865.0	3540.0	3730.0
531	1714.0	1809.0	3428.0	3618.0	625	1732.8	1827.8	3465.6	3655.6	719	1751.6	1846.6	3503.2	3693.2	812	1770.2	1865.2	3540.4	3730.4
532	1714.2	1809.2	3428.4	3618.4	626	1733.0	1828.0	3466.0	3656.0	720	1751.8	1846.8	3503.6	3693.6	813	1770.4	1865.4	3540.8	3730.8
533	1714.4	1809.4	3428.8	3618.8	627	1733.2	1828.2	3466.4	3656.4	721	1752.0	1847.0	3504.0	3694.0	814	1770.6	1865.6	3541.2	3731.2
534	1714.6	1809.6	3429.2	3619.2	628	1733.4	1828.4	3466.8	3656.8	722	1752.2	1847.2	3504.4	3694.4	815	1770.8	1865.8	3541.6	3731.6
535	1714.8	1809.8	3429.6	3619.6	629	1733.6	1828.6	3467.2	3657.2	723	1752.4	1847.4	3504.8	3694.8	816	1771.0	1866.0	3542.0	3732.0
536	1715.0	1810.0	3430.0	3620.0	630	1733.8	1828.8	3467.6	3657.6	724	1752.6	1847.6	3505.2	3695.2	817	1771.2	1866.2	3542.4	3732.4
537	1715.2	1810.2	3430.4	3620.4	631	1734.0	1829.0	3468.0	3658.0	725	1752.8	1847.8	3505.6	3695.6	818	1771.4	1866.4	3542.8	3732.8
538	1715.4	1810.4	3430.8	3620.8	632	1734.2	1829.2	3468.4	3658.4	726	1753.0	1848.0	3506.0	3696.0	819	1771.6	1866.6	3543.2	3733.2
539	1715.6	1810.6	3431.2	3621.2	633	1734.4	1829.4	3468.8	3658.8	727	1753.2	1848.2	3506.4	3696.4	820	1771.8	1866.8	3543.6	3733.6
540	1715.8	1810.8	3431.6	3621.6	634	1734.6	1829.6	3469.2	3659.2	728	1753.4	1848.4	3506.8	3696.8	821	1772.0	1867.0	3544.0	3734.0
541	1716.0	1811.0	3432.0	3622.0	635	1734.8	1829.8	3469.6	3659.6	729	1753.6	1848.6	3507.2	3697.2	822	1772.2	1867.2	3544.4	3734.4
542	1716.2	1811.2	3432.4	3622.4	636	1735.0	1830.0	3470.0	3660.0	730	1753.8	1848.8	3507.6	3697.6	823	1772.4	1867.4	3544.8	3734.8
543	1716.4	1811.4	3432.8	3622.8	637	1735.2	1830.2	3470.4	3660.4	731	1754.0	1849.0	3508.0	3698.0	824	1772.6	1867.6	3545.2	3735.2
544	1716.6	1811.6	3433.2	3623.2	638	1735.4	1830.4	3470.8	3660.8	732	1754.2	1849.2	3508.4	3698.4	825	1772.8	1867.8	3545.6	3735.6
545	1716.8	1811.8	3433.6	3623.6	639	1735.6	1830.6	3471.2	3661.2	733	1754.4	1849.4	3508.8	3698.8	826	1773.0	1868.0	3546.0	3736.0
546	1717.0	1812.0	3434.0	3624.0	640	1735.8	1830.8	3471.6	3661.6	734	1754.6	1849.6	3509.2	3699.2	827	1773.2	1868.2	3546.4	3736.4
547	1717.2	1812.2	3434.4	3624.4	641	1736.0	1831.0	3472.0	3662.0	735	1754.8	1849.8	3509.6	3699.6	828	1773.4	1868.4	3546.8	3736.8
548	1717.4	1812.4	3434.8	3624.8	642	1736.2	1831.2	3472.4	3662.4	736	1755.0	1850.0	3510.0	3700.0	829	1773.6	1868.6	3547.2	3737.2
549	1717.6	1812.6	3435.2	3625.2	643	1736.4	1831.4	3472.8	3662.8	737	1755.2	1850.2	3510.4	3700.4	830	1773.8	1868.8	3547.6	3737.6
550	1717.8	1812.8	3435.6	3625.6	644	1736.6	1831.6	3473.2	3663.2	738	1755.4	1850.4	3510.8	3700.8	831	1774.0	1869.0	3548.0	3738.0
551	1718.0	1813.0	3436.0	3626.0	645	1736.8	1831.8	3473.6	3663.6	739	1755.6	1850.6	3511.2	3701.2	832	1774.2	1869.2	3548.4	3738.4
552	1718.2	1813.2	3436.4	3626.4	646	1737.0	1832.0	3474.0	3664.0	740	1755.8	1850.8	3511.6	3701.6	833	1774.4	1869.4	3548.8	3738.8
553	1718.4	1813.4	3436.8	3626.8	647	1737.2	1832.2	3474.4	3664.4	741	1756.0	1851.0	3512.0	3702.0	834	1774.6	1869.6	3549.2	3739.2
554	1718.6	1813.6	3437.2	3627.2	648	1737.4	1832.4	3474.8	3664.8	742	1756.2	1851.2	3512.4	3702.4	835	1774.8	1869.8	3549.6	3739.6
555	1718.8	1813.8	3437.6	3627.6	649	1737.6	1832.6	3475.2	3665.2	743	1756.4	1851.4	3512.8	3702.8	836	1775.0	1870.0	3550.0	3740.0
556	1719.0	1814.0	3438.0	3628.0	650	1737.8	1832.8	3475.6	3665.6	744	1756.6	1851.6	3513.2	3703.2	837	1775.2	1870.2	3550.4	3740.4
557	1719.2	1814.2	3438.4	3628.4	651	1738.0	1833.0	3476.0	3666.0	745	1756.8	1851.8	3513.6	3703.6	838	1775.4	1870.4	3550.8	3740.8
558	1719.4	1814.4	3438.8	3628.8	652	1738.2	1833.2	3476.4	3666.4	746	1757.0	1852.0	3514.0	3704.0	839	1775.6	1870.6	3551.2	3741.2
559	1719.6	1814.6	3439.2	3629.2	653	1738.4	1833.4	3476.8	3666.8	747	1757.2	1852.2	3514.4	3704.4	840	1775.8	1870.8	3551.6	3741.6
560	1719.8	1814.8	3439.6	3629.6	654	1738.6	1833.6	3477.2	3667.2	748	1757.4	1852.4	3514.8	3704.8	841	1776.0	1871.0	3552.0	3742.0
561	1720.0	1815.0	3440.0	3630.0	655	1738.8	1833.8	3477.6	3667.6	749	1757.6	1852.6	3515.2	3705.2	842	1776.2	1871.2	3552.4	3742.4
562	1720.2	1815.2	3440.4	3630.4	656	1739.0	1834.0	3478.0	3668.0	750	1757.8	1852.8	3515.6	3705.6	843	1776.4	1871.4	3552.8	3742.8
563	1720.4	1815.4	3440.8	3630.8	657	1739.2	1834.2	3478.4	3668.4	751	1758.0	1853.0	3516.0	3706.0	844	1776.6	1871.6	3553.2	3743.2
564	1720.6	1815.6	3441.2	3631.2	658	1739.4	1834.4	3478.8	3668.8	752	1758.2	1853.2	3516.4	3706.4	845	1776.8	1871.8	3553.6	3743.6
565	1720.8	1815.8	3441.6	3631.6	659	1739.6	1834.6	3479.2	3669.2	753	1758.4	1853.4	3516.8	3706.8	846	1777.0	1872.0	3554.0	3744.0
566	1721.0	1816.0	3442.0	3632.0	660	1739.8	1834.8	3479.6	3669.6	754	1758.6	1853.6	3517.2	3707.2	847	1777.2	1872.2	3554.4	3744.4
567	1721.2	1816.2	3442.4	3632.4	661	1740.0	1835.0	3480.0	3670.0	755	1758.8	1853.8	3517.6	3707.6	848	1777.4	1872.4	3554.8	3744.8
568	1721.4	1816.4	3442.8	3632.8	662	1740.2	1835.2	3480.4	3670.4	756	1759.0	1854.0	3518.0	3708.0	849	1777.6	1872.6	3555.2	3745.2
569	1721.6	1816.6	3443.2	3633.2	663	1740.4	1835.4	3480.8	3670.8	757	1759.2	1854.2	3518.4	3708.4	850	1777.8	1872.8	3555.6	3745.6
570	1721.8	1816.8	3443.6	3633.6	664	1740.6	1835.6	3481.2	3671.2	758	1759.4	1854.4	3518.8	3708.8	851	1778.0	1873.0	3556.0	3746.0
571	1722.0	1817.0	3444.0	3634.0	665	1740.8	1835.8	3481.6	3671.6	759	1759.6	1854.6	3519.2	3709.2	852	1778.2	1873.2	3556.4	3746.4
572	1722.2	1817.2	3444.4	3634.4	666	1741.0	1836.0	3482.0	3672.0	760	1759.8	1854.8	3519.6	3709.6	853	1778.4	1873.4	3556.8	3746.8
573	1722.4	1817.4	3444.8	3634.8	667	1741.2	1836.2	3482.4	3672.4	761	1760.0	1855.0	3520.0	3710.0	854	1778.6	1873.6	3557.2	3747.2
574	1722.6	1817.6	3445.2	3635.2	668	1741.4	1836.4	3482.8	3672.8	762	1760.2	1855.2	3520.4	3710.4	855	1778.8	1873.8	3557.6	3747.6
575	1722.8	1817.8	3445.6	3635.6	669	1741.6	1836.6	3483.2	3673.2	763	1760.4	1855.4	3520.8	3710.8	856	1779.0	1874.0	3558.0	3748.0
576	1723.0	1818.0	3446.0	3636.0	670	1741.8	1836.8	3483.6	3673.6	764	1760.6	1855.6	3521.2	3711.2	857	1779.2	1874.2	3558.4	3748.4
577	1723.2	1818.2	3446.4	3636.4	671	1742.0	1837.0	3484.0	3674.0	765	1760.8	1855.8	3521.6	3711.6	858	1779.4	1874.4	3558.8	3748.8
578	1723.4	1818.4	3446.8	3636.8	672	1742.2	1837.2	3484.4	3674.4	766	1761.0	1856.0	3522.0	3712.0	859	1779.6	1874.6	3559.2	3749.2
579	1723.6	1818.6	3447.2	3637.2	673	1742.4	1837.4	3484.8	3674.8	767	1761.2	1856.2	3522.4	3712.4	860	1779.8	1874.8	3559.6	3749.6
580	1723.8	1818.8	3447.6	3637.6	674	1742.6	1837.6	3485.2	3675.2	768	1761.4	1856.4	3522.8	3712.8	861	1780.0	1875.0	3560.0	3750.0
581	1724.0	1819.0	3448.0	3638.0	675	1742.8	1837.8	3485.6	3675.6	769	1761.6	1856.6	3523.2	3713.2	862	1780.2	1875.2	3560.4	3750.4
582	1724.2	1819.2	3448.4	3638.4	676	1743.0	1838.0	3486.0	3676.0	770	1761.8	1856.8	3523.6	3713.6	863	1780.4	1875.4	3560.8	3750.8
583	1724.4	1819.4	3448.8	3638.8	677	1743.2	1838.2	3486.4	3676.4	771	1762.0	1857.0	3524.0	3714.0	864	1780.6	1875.6	3561.2	3751.2
584	1724.6	1819.6	3449.2	3639.2	678	1743.4	1838.4	3486.8	3676.8	772	1762.2	1857.2	3524.4	3714.4	865	1780.8	1875.8	3561.6	3751.6
585	1724.8	1819.8	3449.6	3639.6	679	1743.6	1838.6	3487.2	3677.2	773	1762.4	1857.4	3524.8	3714.8	866	1781.0	1876.0	3562.0	3752.0
586	1725.0	1820.0	3450.0	3640.0	680	1743.8	1838.8	3487.6	3677.6	774	1762.6	1857.6	3525.2	3715.2	867	1781.2	1876.2	3562.4	3752.4
587	1725.2	1820.2	3450.4	3640.4	681	1744.0	1839.0	3488.0	3678.0	775	1762.8	1857.8	3525.6	3715.6	868	1781.4	1876.4	3562.8	3752.8
588	1725.4	1820.4	3450.8	3640.8	682	1744.2	1839.2	3488.4	3678.4	776	1763.0	1858.0	3526.0	3716.0	869	1781.6	1876.6	3563.2	3753.2
589	1725.6	1820.6	3451.2	3641.2	683	1744.4	1839.4	3488.8	3678.8	777	1763.2	1858.2	3526.4	3716.4	870	1781.8	1876.8	3563.6	3753.6
590	1725.8	1820.8	3451.6	3641.6	684	1744.6	1839.6	3489.2	3679.2	778	1763.4	1858.4	3526.8	3716.8	871	1782.0	1877.0	3564.0	3754.0
591	1726.0	1821.0	3452.0	3642.0	685	1744.8	1839.8	3489.6	3679.6	779	1763.6	1858.6	3527.2	3717.2	872	1782.2	1877.2	3564.4	3754.4
592	1726.2	1821.2	3452.4	3642.4	686	1745.0	1840.0	3490.0	3680.0	780	1763.8	1858.8	3527.6	3717.6	873	1782.4	1877.4	3564.8	3754.8
593	1726.4	1821.4	3452.8	3642.8	687	1745.2	1840.2	3490.4	3680.4	781	1764.0	1859.0	3528.0	3718.0	874	1782.6	1877.6	3565.2	3755.2
594	1726.6	1821.6	3453.2	3643.2	688	1745.4	1840.4	3490.8	3680.8	782	1764.2	1859.2	3528.4	3718.4	875	1782.8	1877.8	3565.6	3755.6
595	1726.8	1821.8	3453.6	3643.6	689	1745.6	1840.6	3491.2	3681.2	783	1764.4	1859.4	3528.8	3718.8	876	1783.0	1878.0	3566.0	3756.0
596	1727.0	1822.0	3454.0	3644.0	690	1745.8	1840.8	3491.6	3681.6	784	1764.6	1859.6	3529.2	3719.2	877	1783.2	1878.2	3566.4	3756.4
597	1727.2	1822.2	3454.4	3644.4	691	1746.0	1841.0	3492.0	3682.0	785	1764.8	1859.8	3529.6	3719.6	878	1783.4	1878.4	3566.8	3756.8
598	1727.4	1822.4	3454.8	3644.8	692	1746.2	1841.2	3492.4	3682.4	786	1765.0	1860.0	3530.0	3720.0	879	1783.6	1878.6	3567.2	3757.2
599	1727.6	1822.6	3455.2	3645.2	693	1746.4	1841.4	3492.8	3682.8	787	1765.2	1860.2	3530.4	3720.4	880	1783.8	1878.8	3567.6	3757.6
600	1727.8	1822.8	3455.6	3645.6	694	1746.6	1841.6	3493.2	3683.2	788	1765.4	1860.4	3530.8	3720.8	881	1784.0	1879.0	3568.0	3758.0
601	1728.0	1823.0	3456.0	3646.0	695	1746.8	1841.8	3493.6	3683.6	789	1765.6	1860.6	3531.2	3721.2	882	1784.2	1879.2	3568.4	3758.4
602	1728.2	1823.2	3456.4	3646.4	696	1747.0	1842.0	3494.0	3684.0	790	1765.8	1860.8	3531.6	3721.6	883	1784.4	1879.4	3568.8	3758.8
603	1728.4	1823.4	3456.8	3646.8	697	1747.2	1842.2	3494.4	3684.4	791	1766.0	1861.0	3532.0	3722.0	884	1784.6	1879.6	3569.2	3759.2
604	1728.6	1823.6	3457.2	3647.2	698	1747.4	1842.4	3494.8	3684.8	792	1766.2	1861.2	3532.4	3722.4	885	1784.8	1879.8	3569.6	3759.6
605	1728.8	1823.8	3457.6	3647.6	699	1747.6	1842.6	3495.2	3685.2										

Copyright © 2008 Nokia. All rights reserved.

GSM1900 frequencies

CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX	CH	TX	RX	VCO TX	VCO RX
512	1850,2	1930,2	3700,4	3860,4	606	1869,0	1949,0	3738,0	3898,0	700	1887,8	1967,8	3775,6	3935,6	794	1906,6	1986,6	3813,2	3973,2
513	1850,4	1930,4	3700,8	3860,8	607	1869,2	1949,2	3738,4	3898,4	701	1888,0	1968,0	3776,0	3936,0	795	1906,8	1986,8	3813,6	3973,6
514	1850,6	1930,6	3701,2	3861,2	608	1869,4	1949,4	3738,8	3898,8	702	1888,2	1968,2	3776,4	3936,4	796	1907,0	1987,0	3814,0	3974,0
515	1850,8	1930,8	3701,6	3861,6	609	1869,6	1949,6	3739,2	3899,2	703	1888,4	1968,4	3776,8	3936,8	797	1907,2	1987,2	3814,4	3974,4
516	1851,0	1931,0	3702,0	3862,0	610	1869,8	1949,8	3739,6	3899,6	704	1888,6	1968,6	3777,2	3937,2	798	1907,4	1987,4	3814,8	3974,8
517	1851,2	1931,2	3702,4	3862,4	611	1870,0	1950,0	3740,0	3900,0	705	1888,8	1968,8	3777,6	3937,6	799	1907,6	1987,6	3815,2	3975,2
518	1851,4	1931,4	3702,8	3862,8	612	1870,2	1950,2	3740,4	3900,4	706	1889,0	1969,0	3778,0	3938,0	800	1907,8	1987,8	3815,6	3975,6
519	1851,6	1931,6	3703,2	3863,2	613	1870,4	1950,4	3740,8	3900,8	707	1889,2	1969,2	3778,4	3938,4	801	1908,0	1988,0	3816,0	3976,0
520	1851,8	1931,8	3703,6	3863,6	614	1870,6	1950,6	3741,2	3901,2	708	1889,4	1969,4	3778,8	3938,8	802	1908,2	1988,2	3816,4	3976,4
521	1852,0	1932,0	3704,0	3864,0	615	1870,8	1950,8	3741,6	3901,6	709	1889,6	1969,6	3779,2	3939,2	803	1908,4	1988,4	3816,8	3976,8
522	1852,2	1932,2	3704,4	3864,4	616	1871,0	1951,0	3742,0	3902,0	710	1889,8	1969,8	3779,6	3939,6	804	1908,6	1988,6	3817,2	3977,2
523	1852,4	1932,4	3704,8	3864,8	617	1871,2	1951,2	3742,4	3902,4	711	1890,0	1970,0	3780,0	3940,0	805	1908,8	1988,8	3817,6	3977,6
524	1852,6	1932,6	3705,2	3865,2	618	1871,4	1951,4	3742,8	3902,8	712	1890,2	1970,2	3780,4	3940,4	806	1909,0	1989,0	3818,0	3978,0
525	1852,8	1932,8	3705,6	3865,6	619	1871,6	1951,6	3743,2	3903,2	713	1890,4	1970,4	3780,8	3940,8	807	1909,2	1989,2	3818,4	3978,4
526	1853,0	1933,0	3706,0	3866,0	620	1871,8	1951,8	3743,6	3903,6	714	1890,6	1970,6	3781,2	3941,2	808	1909,4	1989,4	3818,8	3978,8
527	1853,2	1933,2	3706,4	3866,4	621	1872,0	1952,0	3744,0	3904,0	715	1890,8	1970,8	3781,6	3941,6	809	1909,6	1989,6	3819,2	3979,2
528	1853,4	1933,4	3706,8	3866,8	622	1872,2	1952,2	3744,4	3904,4	716	1891,0	1971,0	3782,0	3942,0	810	1909,8	1989,8	3819,6	3979,6
529	1853,6	1933,6	3707,2	3867,2	623	1872,4	1952,4	3744,8	3904,8	717	1891,2	1971,2	3782,4	3942,4					
530	1853,8	1933,8	3707,6	3867,6	624	1872,6	1952,6	3745,2	3905,2	718	1891,4	1971,4	3782,8	3942,8					
531	1854,0	1934,0	3708,0	3868,0	625	1872,8	1952,8	3745,6	3905,6	719	1891,6	1971,6	3783,2	3943,2					
532	1854,2	1934,2	3708,4	3868,4	626	1873,0	1953,0	3746,0	3906,0	720	1891,8	1971,8	3783,6	3943,6					
533	1854,4	1934,4	3708,8	3868,8	627	1873,2	1953,2	3746,4	3906,4	721	1892,0	1972,0	3784,0	3944,0					
534	1854,6	1934,6	3709,2	3869,2	628	1873,4	1953,4	3746,8	3906,8	722	1892,2	1972,2	3784,4	3944,4					
535	1854,8	1934,8	3709,6	3869,6	629	1873,6	1953,6	3747,2	3907,2	723	1892,4	1972,4	3784,8	3944,8					
536	1855,0	1935,0	3710,0	3870,0	630	1873,8	1953,8	3747,6	3907,6	724	1892,6	1972,6	3785,2	3945,2					
537	1855,2	1935,2	3710,4	3870,4	631	1874,0	1954,0	3748,0	3908,0	725	1892,8	1972,8	3785,6	3945,6					
538	1855,4	1935,4	3710,8	3870,8	632	1874,2	1954,2	3748,4	3908,4	726	1893,0	1973,0	3786,0	3946,0					
539	1855,6	1935,6	3711,2	3871,2	633	1874,4	1954,4	3748,8	3908,8	727	1893,2	1973,2	3786,4	3946,4					
540	1855,8	1935,8	3711,6	3871,6	634	1874,6	1954,6	3749,2	3909,2	728	1893,4	1973,4	3786,8	3946,8					
541	1856,0	1936,0	3712,0	3872,0	635	1874,8	1954,8	3749,6	3909,6	729	1893,6	1973,6	3787,2	3947,2					
542	1856,2	1936,2	3712,4	3872,4	636	1875,0	1955,0	3750,0	3910,0	730	1893,8	1973,8	3787,6	3947,6					
543	1856,4	1936,4	3712,8	3872,8	637	1875,2	1955,2	3750,4	3910,4	731	1894,0	1974,0	3788,0	3948,0					
544	1856,6	1936,6	3713,2	3873,2	638	1875,4	1955,4	3750,8	3910,8	732	1894,2	1974,2	3788,4	3948,4					
545	1856,8	1936,8	3713,6	3873,6	639	1875,6	1955,6	3751,2	3911,2	733	1894,4	1974,4	3788,8	3948,8					
546	1857,0	1937,0	3714,0	3874,0	640	1875,8	1955,8	3751,6	3911,6	734	1894,6	1974,6	3789,2	3949,2					
547	1857,2	1937,2	3714,4	3874,4	641	1876,0	1956,0	3752,0	3912,0	735	1894,8	1974,8	3789,6	3949,6					
548	1857,4	1937,4	3714,8	3874,8	642	1876,2	1956,2	3752,4	3912,4	736	1895,0	1975,0	3790,0	3950,0					
549	1857,6	1937,6	3715,2	3875,2	643	1876,4	1956,4	3752,8	3912,8	737	1895,2	1975,2	3790,4	3950,4					
550	1857,8	1937,8	3715,6	3875,6	644	1876,6	1956,6	3753,2	3913,2	738	1895,4	1975,4	3790,8	3950,8					
551	1858,0	1938,0	3716,0	3876,0	645	1876,8	1956,8	3753,6	3913,6	739	1895,6	1975,6	3791,2	3951,2					
552	1858,2	1938,2	3716,4	3876,4	646	1877,0	1957,0	3754,0	3914,0	740	1895,8	1975,8	3791,6	3951,6					
553	1858,4	1938,4	3716,8	3876,8	647	1877,2	1957,2	3754,4	3914,4	741	1896,0	1976,0	3792,0	3952,0					
554	1858,6	1938,6	3717,2	3877,2	648	1877,4	1957,4	3754,8	3914,8	742	1896,2	1976,2	3792,4	3952,4					
555	1858,8	1938,8	3717,6	3877,6	649	1877,6	1957,6	3755,2	3915,2	743	1896,4	1976,4	3792,8	3952,8					
556	1859,0	1939,0	3718,0	3878,0	650	1877,8	1957,8	3755,6	3915,6	744	1896,6	1976,6	3793,2	3953,2					
557	1859,2	1939,2	3718,4	3878,4	651	1878,0	1958,0	3756,0	3916,0	745	1896,8	1976,8	3793,6	3953,6					
558	1859,4	1939,4	3718,8	3878,8	652	1878,2	1958,2	3756,4	3916,4	746	1897,0	1977,0	3794,0	3954,0					
559	1859,6	1939,6	3719,2	3879,2	653	1878,4	1958,4	3756,8	3916,8	747	1897,2	1977,2	3794,4	3954,4					
560	1859,8	1939,8	3719,6	3879,6	654	1878,6	1958,6	3757,2	3917,2	748	1897,4	1977,4	3794,8	3954,8					
561	1860,0	1940,0	3720,0	3880,0	655	1878,8	1958,8	3757,6	3917,6	749	1897,6	1977,6	3795,2	3955,2					
562	1860,2	1940,2	3720,4	3880,4	656	1879,0	1959,0	3758,0	3918,0	750	1897,8	1977,8	3795,6	3955,6					
563	1860,4	1940,4	3720,8	3880,8	657	1879,2	1959,2	3758,4	3918,4	751	1898,0	1978,0	3796,0	3956,0					
564	1860,6	1940,6	3721,2	3881,2	658	1879,4	1959,4	3758,8	3918,8	752	1898,2	1978,2	3796,4	3956,4					
565	1860,8	1940,8	3721,6	3881,6	659	1879,6	1959,6	3759,2	3919,2	753	1898,4	1978,4	3796,8	3956,8					
566	1861,0	1941,0	3722,0	3882,0	660	1879,8	1959,8	3759,6	3919,6	754	1898,6	1978,6	3797,2	3957,2					
567	1861,2	1941,2	3722,4	3882,4	661	1880,0	1960,0	3760,0	3920,0	755	1898,8	1978,8	3797,6	3957,6					
568	1861,4	1941,4	3722,8	3882,8	662	1880,2	1960,2	3760,4	3920,4	756	1899,0	1979,0	3798,0	3958,0					
569	1861,6	1941,6	3723,2	3883,2	663	1880,4	1960,4	3760,8	3920,8	757	1899,2	1979,2	3798,4	3958,4					
570	1861,8	1941,8	3723,6	3883,6	664	1880,6	1960,6	3761,2	3921,2	758	1899,4	1979,4	3798,8	3958,8					
571	1862,0	1942,0	3724,0	3884,0	665	1880,8	1960,8	3761,6	3921,6	759	1899,6	1979,6	3799,2	3959,2					
572	1862,2	1942,2	3724,4	3884,4	666	1881,0	1961,0	3762,0	3922,0	760	1899,8	1979,8	3799,6	3959,6					
573	1862,4	1942,4	3724,8	3884,8	667	1881,2	1961,2	3762,4	3922,4	761	1900,0	1980,0	3800,0	3960,0					
574	1862,6	1942,6	3725,2	3885,2	668	1881,4	1961,4	3762,8	3922,8	762	1900,2	1980,2	3800,4	3960,4					
575	1862,8	1942,8	3725,6	3885,6	669	1881,6	1961,6	3763,2	3923,2	763	1900,4	1980,4	3800,8	3960,8					
576	1863,0	1943,0	3726,0	3886,0	670	1881,8	1961,8	3763,6	3923,6	764	1900,6	1980,6	3801,2	3961,2					
577	1863,2	1943,2	3726,4	3886,4	671	1882,0	1962,0	3764,0	3924,0	765	1900,8	1980,8	3801,6	3961,6					
578	1863,4	1943,4	3726,8	3886,8	672	1882,2	1962,2	3764,4	3924,4	766	1901,0	1981,0	3802,0	3962,0					
579	1863,6	1943,6	3727,2	3887,2	673	1882,4	1962,4	3764,8	3924,8	767	1901,2	1981,2	3802,4	3962,4					
580	1863,8	1943,8	3727,6	3887,6	674	1882,6	1962,6	3765,2	3925,2	768	1901,4	1981,4	3802,8	3962,8					
581	1864,0	1944,0	3728,0	3888,0	675	1882,8	1962,8	3765,6	3925,6	769	1901,6	1981,6	3803,2	3963,2					
582	1864,2	1944,2	3728,4	3888,4	676	1883,0	1963,0	3766,0	3926,0	770	1901,8	1981,8	3803,6	3963,6					
583	1864,4	1944,4	3728,8	3888,8	677	1883,2	1963,2	3766,4	3926,4	771	1902,0	1982,0	3804,0	3964,0					
584	1864,6	1944,6	3729,2	3889,2	678	1883,4	1963,4	3766,8	3926,8	772	1902,2	1982,2	3804,4	3964,4					
585	1864,8	1944,8	3729,6	3889,6	679	1883,6	1963,6	3767,2	3927,2	773	1902,4	1982,4	3804,8	3964,8					
586	1865,0	1945,0	3730,0	3890,0	680	1883,8	1963,8	3767,6	3927,6	774	1902,6	1982,6	3805,2	3965,2					
587	1865,2	1945,2	3730,4	3890,4	681	1884,0	1964,0	3768,0	3928,0	775	1902,8	1982,8	3805,6	3965,6					
588	1865,4	1945,4	3730,8	3890,8	682	1884,2	1964,2	3768,4	3928,4	776	1903,0	1983,0	3806,0	3966,0					
589	1865,6	1945,6	3731,2	3891,2	683	1884,4	1964,4	3768,8	3928,8	777	1903,2	1983,2	3806,4	3966,4					
590	1865,8	1945,8	3731,6	3891,6	684	1884,6	1964,6	3769,2	3929,2	778	1903,4	1983,4	3806,8	3966,8					
591	1866,0	1946,0	3732,0	3892,0	685	1884,8	1964,8	3769,6	3929,6	779	1903,6	1983,6	3807,2	3967,2					
592	1866,2	1946,2	3732,4	3892,4	686	1885,0	1965,0	3770,0	3930,0	780	1903,8	1983,8	3807,6	3967,6					
593	1866,4	1946,4	3732,8	3892,8	687	1885,2	1965,2	3770,4	3930,4	781	1904,0	1984,0	3808,0	3968,0					
594	1866,6	1946,6	3733,2	3893,2	688	1885,4	1965,4	3770,8	3930,8	782	1904,2	1984,2	3808,4	3968,4					
595	1866,8	1946,8	3733,6	3893,6	689	1885,6	1965,6	3771,2	3931,2	783	1904,4	1984,4	3808,8	3968,8					
596	1867,0	1947,0	3734,0	3894,0	690	1885,8	1965,8	3771,6	3931,6	784	1904,6	1984,6	3809,2	3969,2					
597	1867,2	1947,2	3734,4	3894,4	691	1886,0	1966,0	3772,0	3932,0	785	1904,8	1984,8	3809,6	3969,6					
598	1867,4	1947,4	3734,8	3894,8	692	1886,2	1966,2	3772,4	3932,4	786	1905,0	1985,0	3810,0	3970,0					
599	1867,6	1947,6	3735,2	3895,2	693	1886,4	1966,4	3772,8	3932,8	787	1905,2	1985,2	3810,4	3970,4					
600	1867,8	1947,8	3735,6	3895,6	694	1886,6	1966,6	3773,2	3933,2	788	1905,4	1985,4	3810,8	3970,8					
601	1868,0	1948,0	3736,0	3896,0	695	1886,8	1966,8	3773,6	3933,6	789	1905,6	1985,6	3811,2	3971,2					
602	1868,2	1948,2	3736,4	3896,4	696	1887,0	1967,0	3774,0	3934,0	790	1905,8	1985,8	3811,6	3971,6					
603	1868,4	1948,4	3736,8	3896,8	697	1887,2	1967,2	3774,4	3934,4	791	1906,0	1986,0	3812,0	3972,0					
604	1868,6	1948,6	3737,2	3897,2	698	1887,4	1967,4	3774,8	3934,8	792	1906,2	1986,2	3812,4	3972,4					
605	1868,8	1948,8	3737,6	3897,6	699	1887,6	1967,6	3775,2	3935,2	793	1906,4	1986,4	3812,8	3972,8					

Copyright © 2008 Nokia. All rights reserved.

WCDMA 2100 Rx frequencies

Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX	Ch	RX	VCO RX
10562	2112.4	4224.8	10625	2125	4250	10688	2137.6	4275.2	10751	2150.2	4300.4	10814	2162.8	4325.6
10563	2112.6	4225.2	10626	2125.2	4250.4	10689	2137.8	4275.6	10752	2150.4	4300.8	10815	2163	4326
10564	2112.8	4225.6	10627	2125.4	4250.8	10690	2138	4276	10753	2150.6	4301.2	10816	2163.2	4326.4
10565	2113	4226	10628	2125.6	4251.2	10691	2138.2	4276.4	10754	2150.8	4301.6	10817	2163.4	4326.8
10566	2113.2	4226.4	10629	2125.8	4251.6	10692	2138.4	4276.8	10755	2151	4302	10818	2163.6	4327.2
10567	2113.4	4226.8	10630	2126	4252	10693	2138.6	4277.2	10756	2151.2	4302.4	10819	2163.8	4327.6
10568	2113.6	4227.2	10631	2126.2	4252.4	10694	2138.8	4277.6	10757	2151.4	4302.8	10820	2164	4328
10569	2113.8	4227.6	10632	2126.4	4252.8	10695	2139	4278	10758	2151.6	4303.2	10821	2164.2	4328.4
10570	2114	4228	10633	2126.6	4253.2	10696	2139.2	4278.4	10759	2151.8	4303.6	10822	2164.4	4328.8
10571	2114.2	4228.4	10634	2126.8	4253.6	10697	2139.4	4278.8	10760	2152	4304	10823	2164.6	4329.2
10572	2114.4	4228.8	10635	2127	4254	10698	2139.6	4279.2	10761	2152.2	4304.4	10824	2164.8	4329.6
10573	2114.6	4229.2	10636	2127.2	4254.4	10699	2139.8	4279.6	10762	2152.4	4304.8	10825	2165	4330
10574	2114.8	4229.6	10637	2127.4	4254.8	10700	2140	4280	10763	2152.6	4305.2	10826	2165.2	4330.4
10575	2115	4230	10638	2127.6	4255.2	10701	2140.2	4280.4	10764	2152.8	4305.6	10827	2165.4	4330.8
10576	2115.2	4230.4	10639	2127.8	4255.6	10702	2140.4	4280.8	10765	2153	4306	10828	2165.6	4331.2
10577	2115.4	4230.8	10640	2128	4256	10703	2140.6	4281.2	10766	2153.2	4306.4	10829	2165.8	4331.6
10578	2115.6	4231.2	10641	2128.2	4256.4	10704	2140.8	4281.6	10767	2153.4	4306.8	10830	2166	4332
10579	2115.8	4231.6	10642	2128.4	4256.8	10705	2141	4282	10768	2153.6	4307.2	10831	2166.2	4332.4
10580	2116	4232	10643	2128.6	4257.2	10706	2141.2	4282.4	10769	2153.8	4307.6	10832	2166.4	4332.8
10581	2116.2	4232.4	10644	2128.8	4257.6	10707	2141.4	4282.8	10770	2154	4308	10833	2166.6	4333.2
10582	2116.4	4232.8	10645	2129	4258	10708	2141.6	4283.2	10771	2154.2	4308.4	10834	2166.8	4333.6
10583	2116.6	4233.2	10646	2129.2	4258.4	10709	2141.8	4283.6	10772	2154.4	4308.8	10835	2167	4334
10584	2116.8	4233.6	10647	2129.4	4258.8	10710	2142	4284	10773	2154.6	4309.2	10836	2167.2	4334.4
10585	2117	4234	10648	2129.6	4259.2	10711	2142.2	4284.4	10774	2154.8	4309.6	10837	2167.4	4334.8
10586	2117.2	4234.4	10649	2129.8	4259.6	10712	2142.4	4284.8	10775	2155	4310	10838	2167.6	4335.2
10587	2117.4	4234.8	10650	2130	4260	10713	2142.6	4285.2	10776	2155.2	4310.4			
10588	2117.6	4235.2	10651	2130.2	4260.4	10714	2142.8	4285.6	10777	2155.4	4310.8			
10589	2117.8	4235.6	10652	2130.4	4260.8	10715	2143	4286	10778	2155.6	4311.2			
10590	2118	4236	10653	2130.6	4261.2	10716	2143.2	4286.4	10779	2155.8	4311.6			
10591	2118.2	4236.4	10654	2130.8	4261.6	10717	2143.4	4286.8	10780	2156	4312			
10592	2118.4	4236.8	10655	2131	4262	10718	2143.6	4287.2	10781	2156.2	4312.4			
10593	2118.6	4237.2	10656	2131.2	4262.4	10719	2143.8	4287.6	10782	2156.4	4312.8			
10594	2118.8	4237.6	10657	2131.4	4262.8	10720	2144	4288	10783	2156.6	4313.2			
10595	2119	4238	10658	2131.6	4263.2	10721	2144.2	4288.4	10784	2156.8	4313.6			
10596	2119.2	4238.4	10659	2131.8	4263.6	10722	2144.4	4288.8	10785	2157	4314			
10597	2119.4	4238.8	10660	2132	4264	10723	2144.6	4289.2	10786	2157.2	4314.4			
10598	2119.6	4239.2	10661	2132.2	4264.4	10724	2144.8	4289.6	10787	2157.4	4314.8			
10599	2119.8	4239.6	10662	2132.4	4264.8	10725	2145	4290	10788	2157.6	4315.2			
10600	2120	4240	10663	2132.6	4265.2	10726	2145.2	4290.4	10789	2157.8	4315.6			
10601	2120.2	4240.4	10664	2132.8	4265.6	10727	2145.4	4290.8	10790	2158	4316			
10602	2120.4	4240.8	10665	2133	4266	10728	2145.6	4291.2	10791	2158.2	4316.4			
10603	2120.6	4241.2	10666	2133.2	4266.4	10729	2145.8	4291.6	10792	2158.4	4316.8			
10604	2120.8	4241.6	10667	2133.4	4266.8	10730	2146	4292	10793	2158.6	4317.2			
10605	2121	4242	10668	2133.6	4267.2	10731	2146.2	4292.4	10794	2158.8	4317.6			
10606	2121.2	4242.4	10669	2133.8	4267.6	10732	2146.4	4292.8	10795	2159	4318			
10607	2121.4	4242.8	10670	2134	4268	10733	2146.6	4293.2	10796	2159.2	4318.4			
10608	2121.6	4243.2	10671	2134.2	4268.4	10734	2146.8	4293.6	10797	2159.4	4318.8			
10609	2121.8	4243.6	10672	2134.4	4268.8	10735	2147	4294	10798	2159.6	4319.2			
10610	2122	4244	10673	2134.6	4269.2	10736	2147.2	4294.4	10799	2159.8	4319.6			
10611	2122.2	4244.4	10674	2134.8	4269.6	10737	2147.4	4294.8	10800	2160	4320			
10612	2122.4	4244.8	10675	2135	4270	10738	2147.6	4295.2	10801	2160.2	4320.4			
10613	2122.6	4245.2	10676	2135.2	4270.4	10739	2147.8	4295.6	10802	2160.4	4320.8			
10614	2122.8	4245.6	10677	2135.4	4270.8	10740	2148	4296	10803	2160.6	4321.2			
10615	2123	4246	10678	2135.6	4271.2	10741	2148.2	4296.4	10804	2160.8	4321.6			
10616	2123.2	4246.4	10679	2135.8	4271.6	10742	2148.4	4296.8	10805	2161	4322			
10617	2123.4	4246.8	10680	2136	4272	10743	2148.6	4297.2	10806	2161.2	4322.4			
10618	2123.6	4247.2	10681	2136.2	4272.4	10744	2148.8	4297.6	10807	2161.4	4322.8			
10619	2123.8	4247.6	10682	2136.4	4272.8	10745	2149	4298	10808	2161.6	4323.2			
10620	2124	4248	10683	2136.6	4273.2	10746	2149.2	4298.4	10809	2161.8	4323.6			
10621	2124.2	4248.4	10684	2136.8	4273.6	10747	2149.4	4298.8	10810	2162	4324			
10622	2124.4	4248.8	10685	2137	4274	10748	2149.6	4299.2	10811	2162.2	4324.4			
10623	2124.6	4249.2	10686	2137.2	4274.4	10749	2149.8	4299.6	10812	2162.4	4324.8			
10624	2124.8	4249.6	10687	2137.4	4274.8	10750	2150	4300	10813	2162.6	4325.2			

Copyright © 2008 Nokia. All rights reserved.

WCDMA 2100 Tx frequencies

Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx	Ch	Tx	VCO Tx
9612	1922.4	3844.8	9671	1934.2	3868.4	9730	1946	3892	9789	1957.8	3915.6	9848	1969.6	3939.2
9613	1922.6	3845.2	9672	1934.4	3868.8	9731	1946.2	3892.4	9790	1958	3916	9849	1969.8	3939.6
9614	1922.8	3845.6	9673	1934.6	3869.2	9732	1946.4	3892.8	9791	1958.2	3916.4	9850	1970	3940
9615	1923	3846	9674	1934.8	3869.6	9733	1946.6	3893.2	9792	1958.4	3916.8	9851	1970.2	3940.4
9616	1923.2	3846.4	9675	1935	3870	9734	1946.8	3893.6	9793	1958.6	3917.2	9852	1970.4	3940.8
9617	1923.4	3846.8	9676	1935.2	3870.4	9735	1947	3894	9794	1958.8	3917.6	9853	1970.6	3941.2
9618	1923.6	3847.2	9677	1935.4	3870.8	9736	1947.2	3894.4	9795	1959	3918	9854	1970.8	3941.6
9619	1923.8	3847.6	9678	1935.6	3871.2	9737	1947.4	3894.8	9796	1959.2	3918.4	9855	1971	3942
9620	1924	3848	9679	1935.8	3871.6	9738	1947.6	3895.2	9797	1959.4	3918.8	9856	1971.2	3942.4
9621	1924.2	3848.4	9680	1936	3872	9739	1947.8	3895.6	9798	1959.6	3919.2	9857	1971.4	3942.8
9622	1924.4	3848.8	9681	1936.2	3872.4	9740	1948	3896	9799	1959.8	3919.6	9858	1971.6	3943.2
9623	1924.6	3849.2	9682	1936.4	3872.8	9741	1948.2	3896.4	9800	1960	3920	9859	1971.8	3943.6
9624	1924.8	3849.6	9683	1936.6	3873.2	9742	1948.4	3896.8	9801	1960.2	3920.4	9860	1972	3944
9625	1925	3850	9684	1936.8	3873.6	9743	1948.6	3897.2	9802	1960.4	3920.8	9861	1972.2	3944.4
9626	1925.2	3850.4	9685	1937	3874	9744	1948.8	3897.6	9803	1960.6	3921.2	9862	1972.4	3944.8
9627	1925.4	3850.8	9686	1937.2	3874.4	9745	1949	3898	9804	1960.8	3921.6	9863	1972.6	3945.2
9628	1925.6	3851.2	9687	1937.4	3874.8	9746	1949.2	3898.4	9805	1961	3922	9864	1972.8	3945.6
9629	1925.8	3851.6	9688	1937.6	3875.2	9747	1949.4	3898.8	9806	1961.2	3922.4	9865	1973	3946
9630	1926	3852	9689	1937.8	3875.6	9748	1949.6	3899.2	9807	1961.4	3922.8	9866	1973.2	3946.4
9631	1926.2	3852.4	9690	1938	3876	9749	1949.8	3899.6	9808	1961.6	3923.2	9867	1973.4	3946.8
9632	1926.4	3852.8	9691	1938.2	3876.4	9750	1950	3900	9809	1961.8	3923.6	9868	1973.6	3947.2
9633	1926.6	3853.2	9692	1938.4	3876.8	9751	1950.2	3900.4	9810	1962	3924	9869	1973.8	3947.6
9634	1926.8	3853.6	9693	1938.6	3877.2	9752	1950.4	3900.8	9811	1962.2	3924.4	9870	1974	3948
9635	1927	3854	9694	1938.8	3877.6	9753	1950.6	3901.2	9812	1962.4	3924.8	9871	1974.2	3948.4
9636	1927.2	3854.4	9695	1939	3878	9754	1950.8	3901.6	9813	1962.6	3925.2	9872	1974.4	3948.8
9637	1927.4	3854.8	9696	1939.2	3878.4	9755	1951	3902	9814	1962.8	3925.6	9873	1974.6	3949.2
9638	1927.6	3855.2	9697	1939.4	3878.8	9756	1951.2	3902.4	9815	1963	3926	9874	1974.8	3949.6
9639	1927.8	3855.6	9698	1939.6	3879.2	9757	1951.4	3902.8	9816	1963.2	3926.4	9875	1975	3950
9640	1928	3856	9699	1939.8	3879.6	9758	1951.6	3903.2	9817	1963.4	3926.8	9876	1975.2	3950.4
9641	1928.2	3856.4	9700	1940	3880	9759	1951.8	3903.6	9818	1963.6	3927.2	9877	1975.4	3950.8
9642	1928.4	3856.8	9701	1940.2	3880.4	9760	1952	3904	9819	1963.8	3927.6	9878	1975.6	3951.2
9643	1928.6	3857.2	9702	1940.4	3880.8	9761	1952.2	3904.4	9820	1964	3928	9879	1975.8	3951.6
9644	1928.8	3857.6	9703	1940.6	3881.2	9762	1952.4	3904.8	9821	1964.2	3928.4	9880	1976	3952
9645	1929	3858	9704	1940.8	3881.6	9763	1952.6	3905.2	9822	1964.4	3928.8	9881	1976.2	3952.4
9646	1929.2	3858.4	9705	1941	3882	9764	1952.8	3905.6	9823	1964.6	3929.2	9882	1976.4	3952.8
9647	1929.4	3858.8	9706	1941.2	3882.4	9765	1953	3906	9824	1964.8	3929.6	9883	1976.6	3953.2
9648	1929.6	3859.2	9707	1941.4	3882.8	9766	1953.2	3906.4	9825	1965	3930	9884	1976.8	3953.6
9649	1929.8	3859.6	9708	1941.6	3883.2	9767	1953.4	3906.8	9826	1965.2	3930.4	9885	1977	3954
9650	1930	3860	9709	1941.8	3883.6	9768	1953.6	3907.2	9827	1965.4	3930.8	9886	1977.2	3954.4
9651	1930.2	3860.4	9710	1942	3884	9769	1953.8	3907.6	9828	1965.6	3931.2	9887	1977.4	3954.8
9652	1930.4	3860.8	9711	1942.2	3884.4	9770	1954	3908	9829	1965.8	3931.6	9888	1977.6	3955.2
9653	1930.6	3861.2	9712	1942.4	3884.8	9771	1954.2	3908.4	9830	1966	3932			
9654	1930.8	3861.6	9713	1942.6	3885.2	9772	1954.4	3908.8	9831	1966.2	3932.4			
9655	1931	3862	9714	1942.8	3885.6	9773	1954.6	3909.2	9832	1966.4	3932.8			
9656	1931.2	3862.4	9715	1943	3886	9774	1954.8	3909.6	9833	1966.6	3933.2			
9657	1931.4	3862.8	9716	1943.2	3886.4	9775	1955	3910	9834	1966.8	3933.6			
9658	1931.6	3863.2	9717	1943.4	3886.8	9776	1955.2	3910.4	9835	1967	3934			
9659	1931.8	3863.6	9718	1943.6	3887.2	9777	1955.4	3910.8	9836	1967.2	3934.4			
9660	1932	3864	9719	1943.8	3887.6	9778	1955.6	3911.2	9837	1967.4	3934.8			
9661	1932.2	3864.4	9720	1944	3888	9779	1955.8	3911.6	9838	1967.6	3935.2			
9662	1932.4	3864.8	9721	1944.2	3888.4	9780	1956	3912	9839	1967.8	3935.6			
9663	1932.6	3865.2	9722	1944.4	3888.8	9781	1956.2	3912.4	9840	1968	3936			
9664	1932.8	3865.6	9723	1944.6	3889.2	9782	1956.4	3912.8	9841	1968.2	3936.4			
9665	1933	3866	9724	1944.8	3889.6	9783	1956.6	3913.2	9842	1968.4	3936.8			
9666	1933.2	3866.4	9725	1945	3890	9784	1956.8	3913.6	9843	1968.6	3937.2			
9667	1933.4	3866.8	9726	1945.2	3890.4	9785	1957	3914	9844	1968.8	3937.6			
9668	1933.6	3867.2	9727	1945.4	3890.8	9786	1957.2	3914.4	9845	1969	3938			
9669	1933.8	3867.6	9728	1945.6	3891.2	9787	1957.4	3914.8	9846	1969.2	3938.4			
9670	1934	3868	9729	1945.8	3891.6	9788	1957.6	3915.2	9847	1969.4	3938.8			

Copyright © 2008 Nokia. All rights reserved.

WCDMA VIII (900) frequencies

Uplink CH (TX)	Freq (MHz)	VCO (MHz)	Downlink CH (RX)	Freq (MHz)	VCO (MHz)
2712	882,4	3529,6	2937	927,4	3709,6
2713	882,6	3530,4	2938	927,6	3710,4
2714	882,8	3531,2	2939	927,8	3711,2
2715	883	3532	2940	928	3712
2716	883,2	3532,8	2941	928,2	3712,8
2717	883,4	3533,6	2942	928,4	3713,6
2718	883,6	3534,4	2943	928,6	3714,4
2719	883,8	3535,2	2944	928,8	3715,2
2720	884	3536	2945	929	3716
2721	884,2	3536,8	2946	929,2	3716,8
2722	884,4	3537,6	2947	929,4	3717,6
2723	884,6	3538,4	2948	929,6	3718,4
2724	884,8	3539,2	2949	929,8	3719,2
2725	885	3540	2950	930	3720
2726	885,2	3540,8	2951	930,2	3720,8
2727	885,4	3541,6	2952	930,4	3721,6
2728	885,6	3542,4	2953	930,6	3722,4
2729	885,8	3543,2	2954	930,8	3723,2
2730	886	3544	2955	931	3724
2731	886,2	3544,8	2956	931,2	3724,8
2732	886,4	3545,6	2957	931,4	3725,6
2733	886,6	3546,4	2958	931,6	3726,4
2734	886,8	3547,2	2959	931,8	3727,2
2735	887	3548	2960	932	3728
2736	887,2	3548,8	2961	932,2	3728,8
2737	887,4	3549,6	2962	932,4	3729,6
2738	887,6	3550,4	2963	932,6	3730,4
2739	887,8	3551,2	2964	932,8	3731,2
2740	888	3552	2965	933	3732
2741	888,2	3552,8	2966	933,2	3732,8
2742	888,4	3553,6	2967	933,4	3733,6
2743	888,6	3554,4	2968	933,6	3734,4
2744	888,8	3555,2	2969	933,8	3735,2

Copyright © 2008 Nokia. All rights reserved.

Uplink CH (TX)	Freq (MHz)	VCO (MHz)	Downlink CH (RX)	Freq (MHz)	VCO (MHz)
2745	889	3556	2970	934	3736
2746	889,2	3556,8	2971	934,2	3736,8
2747	889,4	3557,6	2972	934,4	3737,6
2748	889,6	3558,4	2973	934,6	3738,4
2749	889,8	3559,2	2974	934,8	3739,2
2750	890	3560	2975	935	3740
2751	890,2	3560,8	2976	935,2	3740,8
2752	890,4	3561,6	2977	935,4	3741,6
2753	890,6	3562,4	2978	935,6	3742,4
2754	890,8	3563,2	2979	935,8	3743,2
2755	891	3564	2980	936	3744
2756	891,2	3564,8	2981	936,2	3744,8
2757	891,4	3565,6	2982	936,4	3745,6
2758	891,6	3566,4	2983	936,6	3746,4
2759	891,8	3567,2	2984	936,8	3747,2
2760	892	3568	2985	937	3748
2761	892,2	3568,8	2986	937,2	3748,8
2762	892,4	3569,6	2987	937,4	3749,6
2763	892,6	3570,4	2988	937,6	3750,4
2764	892,8	3571,2	2989	937,8	3751,2
2765	893	3572	2990	938	3752
2766	893,2	3572,8	2991	938,2	3752,8
2767	893,4	3573,6	2992	938,4	3753,6
2768	893,6	3574,4	2993	938,6	3754,4
2769	893,8	3575,2	2994	938,8	3755,2
2770	894	3576	2995	939	3756
2771	894,2	3576,8	2996	939,2	3756,8
2772	894,4	3577,6	2997	939,4	3757,6
2773	894,6	3578,4	2998	939,6	3758,4
2774	894,8	3579,2	2999	939,8	3759,2
2775	895	3580	3000	940	3760
2776	895,2	3580,8	3001	940,2	3760,8
2777	895,4	3581,6	3002	940,4	3761,6
2778	895,6	3582,4	3003	940,6	3762,4
2779	895,8	3583,2	3004	940,8	3763,2

Copyright © 2008 Nokia. All rights reserved.

Uplink CH (TX)	Freq (MHz)	VCO (MHz)	Downlink CH (RX)	Freq (MHz)	VCO (MHz)
2780	896	3584	3005	941	3764
2781	896,2	3584,8	3006	941,2	3764,8
2782	896,4	3585,6	3007	941,4	3765,6
2783	896,6	3586,4	3008	941,6	3766,4
2784	896,8	3587,2	3009	941,8	3767,2
2785	897	3588	3010	942	3768
2786	897,2	3588,8	3011	942,2	3768,8
2787	897,4	3589,6	3012	942,4	3769,6
2788	897,6	3590,4	3013	942,6	3770,4
2789	897,8	3591,2	3014	942,8	3771,2
2790	898	3592	3015	943	3772
2791	898,2	3592,8	3016	943,2	3772,8
2792	898,4	3593,6	3017	943,4	3773,6
2793	898,6	3594,4	3018	943,6	3774,4
2794	898,8	3595,2	3019	943,8	3775,2
2795	899	3596	3020	944	3776
2796	899,2	3596,8	3021	944,2	3776,8
2797	899,4	3597,6	3022	944,4	3777,6
2798	899,6	3598,4	3023	944,6	3778,4
2799	899,8	3599,2	3024	944,8	3779,2
2800	900	3600	3025	945	3780
2801	900,2	3600,8	3026	945,2	3780,8
2802	900,4	3601,6	3027	945,4	3781,6
2803	900,6	3602,4	3028	945,6	3782,4
2804	900,8	3603,2	3029	945,8	3783,2
2805	901	3604	3030	946	3784
2806	901,2	3604,8	3031	946,2	3784,8
2807	901,4	3605,6	3032	946,4	3785,6
2808	901,6	3606,4	3033	946,6	3786,4
2809	901,8	3607,2	3034	946,8	3787,2
2810	902	3608	3035	947	3788
2811	902,2	3608,8	3036	947,2	3788,8
2812	902,4	3609,6	3037	947,4	3789,6
2813	902,6	3610,4	3038	947,6	3790,4
2814	902,8	3611,2	3039	947,8	3791,2

Copyright © 2008 Nokia. All rights reserved.

Uplink CH (TX)	Freq (MHz)	VCO (MHz)	Downlink CH (RX)	Freq (MHz)	VCO (MHz)
2815	903	3612	3040	948	3792
2816	903,2	3612,8	3041	948,2	3792,8
2817	903,4	3613,6	3042	948,4	3793,6
2818	903,6	3614,4	3043	948,6	3794,4
2819	903,8	3615,2	3044	948,8	3795,2
2820	904	3616	3045	949	3796
2821	904,2	3616,8	3046	949,2	3796,8
2822	904,4	3617,6	3047	949,4	3797,6
2823	904,6	3618,4	3048	949,6	3798,4
2824	904,8	3619,2	3049	949,8	3799,2
2825	905	3620	3050	950	3800
2826	905,2	3620,8	3051	950,2	3800,8
2827	905,4	3621,6	3052	950,4	3801,6
2828	905,6	3622,4	3053	950,6	3802,4
2829	905,8	3623,2	3054	950,8	3803,2
2830	906	3624	3055	951	3804
2831	906,2	3624,8	3056	951,2	3804,8
2832	906,4	3625,6	3057	951,4	3805,6
2833	906,6	3626,4	3058	951,6	3806,4
2834	906,8	3627,2	3059	951,8	3807,2
2835	907	3628	3060	952	3808
2836	907,2	3628,8	3061	952,2	3808,8
2837	907,4	3629,6	3062	952,4	3809,6
2838	907,6	3630,4	3063	952,6	3810,4
2839	907,8	3631,2	3064	952,8	3811,2
2840	908	3632	3065	953	3812
2841	908,2	3632,8	3066	953,2	3812,8
2842	908,4	3633,6	3067	953,4	3813,6
2843	908,6	3634,4	3068	953,6	3814,4
2844	908,8	3635,2	3069	953,8	3815,2
2845	909	3636	3070	954	3816
2846	909,2	3636,8	3071	954,2	3816,8
2847	909,4	3637,6	3072	954,4	3817,6
2848	909,6	3638,4	3073	954,6	3818,4
2849	909,8	3639,2	3074	954,8	3819,2

Copyright © 2008 Nokia. All rights reserved.

Uplink CH (TX)	Freq (MHz)	VCO (MHz)	Downlink CH (RX)	Freq (MHz)	VCO (MHz)
2850	910	3640	3075	955	3820
2851	910,2	3640,8	3076	955,2	3820,8
2852	910,4	3641,6	3077	955,4	3821,6
2853	910,6	3642,4	3078	955,6	3822,4
2854	910,8	3643,2	3079	955,8	3823,2
2855	911	3644	3080	956	3824
2856	911,2	3644,8	3081	956,2	3824,8
2857	911,4	3645,6	3082	956,4	3825,6
2858	911,6	3646,4	3083	956,6	3826,4
2859	911,8	3647,2	3084	956,8	3827,2
2860	912	3648	3085	957	3828
2861	912,2	3648,8	3086	957,2	3828,8
2862	912,4	3649,6	3087	957,4	3829,6
2863	912,6	3650,4	3088	957,6	3830,4

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

Glossary

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.

A/D-converter	Analogue-to-digital converter
ACI	Accessory Control Interface
ADC	Analogue-to-digital converter
ADSP	Application DPS (expected to run high level tasks)
AGC	Automatic gain control (maintains volume)
ALS	Ambient light sensor
AMSL	After Market Service Leader
ARM	Advanced RISC Machines
ARPU	Average revenue per user (per month or per year)
ASIC	Application Specific Integrated Circuit
ASIP	Application Specific Interface Protector
B2B	Board to board, connector between PWB and UI board
BA	Board Assembly
BB	Baseband
BC02	Bluetooth module made by CSR
BIQUAD	Bi-quadratic (type of filter function)
BSI	Battery Size Indicator
BT	Bluetooth
CBus	MCU controlled serial bus connected to UPP_WD2, UEME and Zocus
CCP	Compact Camera Port
CDMA	Code division multiple access
CDSP	Cellular DSP (expected to run at low levels)
CLDC	Connected limited device configuration
CMOS	Complimentary metal-oxide semiconductor circuit (low power consumption)
COF	Chip on Foil
COG	Chip on Glass
CPU	Central Processing Unit
CSD	Circuit-switched data
CSR	Cambridge silicon radio
CSTN	Colour Super Twisted Nematic
CTSI	Clock Timing Sleep and interrupt block of Tiku
CW	Continuous wave
D/A-converter	Digital-to-analogue converter
DAC	Digital-to-analogue converter
DBI	Digital Battery Interface
DBus	DSP controlled serial bus connected between UPP_WD2 and Helgo

Copyright © 2008 Nokia. All rights reserved.

DCT-4	Digital Core Technology
DMA	Direct memory access
DP	Data Package
DPLL	Digital Phase Locked Loop
DSP	Digital Signal Processor
DTM	Dual Transfer Mode
DtoS	Differential to Single ended
EDGE	Enhanced data rates for global/GSM evolution
EGSM	Extended GSM
EM	Energy management
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
ESD	Electrostatic discharge
FCI	Functional cover interface
FPS	Flash Programming Tool
FR	Full rate
FSTN	Film compensated super twisted nematic
GMSK	Gaussian Minimum Shift Keying
GND	Ground, conductive mass
GPIB	General-purpose interface bus
GPRS	General Packet Radio Service
GSM	Group Special Mobile/Global System for Mobile communication
HSDPA	High-speed downlink packet access
HF	Hands free
HFCM	Handsfree Common
HS	Handset
HSCSD	High speed circuit switched data (data transmission connection faster than GSM)
HW	Hardware
I/O	Input/Output
IBAT	Battery current
IC	Integrated circuit
ICHAR	Charger current
IF	Interface
IHF	Integrated hands free
IMEI	International Mobile Equipment Identity
IR	Infrared

Copyright © 2008 Nokia. All rights reserved.

IrDA	Infrared Data Association
ISA	Intelligent software architecture
JPEG/JPG	Joint Photographic Experts Group
LCD	Liquid Crystal Display
LDO	Low Drop Out
LED	Light-emitting diode
LPRF	Low Power Radio Frequency
MCU	Micro Controller Unit (microprocessor)
MCU	Multiport control unit
MIC, mic	Microphone
MIDP	Mobile Information Device Profile
MIN	Mobile identification number
MIPS	Million instructions per second
MMC	Multimedia card
MMS	Multimedia messaging service
MTP	Multipoint-to-point connection
NFC	Near field communication
NTC	Negative temperature coefficient, temperature sensitive resistor used as a temperature sensor
OMA	Object management architecture
OMAP	Operations, maintenance, and administration part
Opamp	Operational Amplifier
PA	Power amplifier
PDA	Pocket Data Application
PDA	Personal digital assistant
PDRAM	Program/Data RAM (on chip in Tiku)
Phoenix	Software tool of DCT4.x and BB5
PIM	Personal Information Management
PLL	Phase locked loop
PM	(Phone) Permanent memory
PUP	General Purpose IO (PIO), USARTS and Pulse Width Modulators
PURX	Power-up reset
PWB	Printed Wiring Board
PWM	Pulse width modulation
RC-filter	Resistance-Capacitance filter
RF	Radio Frequency

Copyright © 2008 Nokia. All rights reserved.

RF PopPort™	Reduced function PopPort™ interface
RFBUS	Serial control Bus For RF
RSK	Right Soft Key
RS-MMC	Reduced size Multimedia Card
RSS	Web content Syndication Format
RSSI	Receiving signal strength indicator
RST	Reset Switch
RTC	Real Time Clock (provides date and time)
RX	Radio Receiver
SARAM	Single Access RAM
SAW filter	Surface Acoustic Wave filter
SDRAM	Synchronous Dynamic Random Access Memory
SID	Security ID
SIM	Subscriber Identity Module
SMPS	Switched Mode Power Supply
SNR	Signal-to-noise ratio
SPR	Standard Product requirements
SRAM	Static random access memory
STI	Serial Trace Interface
SW	Software
SWIM	Subscriber/Wallet Identification Module
TCP/IP	Transmission control protocol/Internet protocol
TCXO	Temperature controlled Oscillator
Tiku	Finnish for Chip, Successor of the UPP
TX	Radio Transmitter
UART	Universal asynchronous receiver/transmitter
UEME	Universal Energy Management chip (Enhanced version)
UEMEK	See UEME
UI	User Interface
UPnP	Universal Plug and Play
UPP	Universal Phone Processor
UPP_WD2	Communicator version of DCT4 system ASIC
USB	Universal Serial Bus
VBAT	Battery voltage
VCHAR	Charger voltage
VCO	Voltage controlled oscillator

Copyright © 2008 Nokia. All rights reserved.

VCTCXO	Voltage Controlled Temperature Compensated Crystal Oscillator
VCXO	Voltage Controlled Crystal Oscillator
VF	View Finder
Vp-p	Peak-to-peak voltage
VSIM	SIM voltage
WAP	Wireless application protocol
WCDMA	Wideband code division multiple access
WD	Watchdog
WLAN	Wireless local area network
XHTML	Extensible hypertext markup language
Zocus	Current sensor (used to monitor the current flow to and from the battery)

Copyright © 2008 Nokia. All rights reserved.

(This page left intentionally blank.)

Copyright © 2008 Nokia. All rights reserved.